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FOREWORD

The *United States Armed Forces Medical Journal* is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense. The Assistant to the Secretary of Defense (Health and Medical) and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this *Journal.*

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Monthly Message

The Secretary of Defense has appointed an Assistant to the Secretary of Defense with responsibility for all health and medical matters within and involving his Department. This newly created office has organizationally replaced the Armed Forces Medical Policy Council effective 1 April 1953.

I have been appointed as Assistant to the Secretary of Defense to carry on as his advisor in health and medical matters. Close liaison will be continued between this office and the offices of the Surgeons General in the interest of coordination with their operational responsibilities in the implementation of general medical policies. One of the major changes involved is the creation of an advisory council to the Assistant to the Secretary of Defense, consisting of 6 civilian members selected from among national authorities in the health and medical fields of endeavor.

Appointments as members of the newly established civilian advisory council have been tendered and accepted by the following nationally eminent men: Isidor S. Ravdin, M. D., Surgeon-in-Chief and John Rhea Barton Professor of Surgery at the University of Pennsylvania; Alfred R. Shands, Jr., M. D., Medical Director of the Nemours Foundation, Alfred I. DuPont Institute in Wilmington, Del., and formerly Associate Professor of Orthopedic Surgery at Duke University; James P. Hollers, D. D. S., practicing dentist in San Antonio, Tex., who is a past president of the National Association of Reserve Officers; William S. Middleton, M. D., Dean and Professor of Internal Medicine, University of Wisconsin School of Medicine; Dwight L. Wilbur, M. D., Professor of Clinical Medicine at Stanford University School of Medicine; and Anthony J. J. Rourke, M. D., President of the Hospital Council of Greater New York and former President of the American Hospital Association.

Through the office of the Assistant to the Secretary of Defense, the medical services will continue to advance in the efficient accomplishment of their combined military missions.

Melvin A. Casberg, M. D.
Assistant to the Secretary of Defense
(Health and Medical)

THE ARMED FORCES MEDICAL POLICY COUNCIL

REORGANIZATION OF ARMED FORCES MEDICAL POLICY COUNCIL ANNOUNCED

The Armed Forces Medical Policy Council of the Office of the Secretary of Defense was reorganized on 1 April 1953 and has become the Office of the Assistant to the Secretary of Defense, as announced in Dr. Casberg's Monthly Message in this issue.

The staff of the former Armed Forces Medical Policy Council will continue in the newly created office. Some staff reorganization may occur at a future date.

III. Military Affairs Coordination Division *(1)*

THE Military Affairs Coordination Division of the Armed Forces Medical Policy Council (fig. 1) develops, coordinates, and recommends medical and health policies which are currently required for the guidance of the 3 military departments. The present medical programs of the military services are continuously under review in order to develop uniform programs within 2 or more military departments, initiate joint programs between 2 or more military departments, and establish cross utilization of medical facilities. This Division develops standardization of medical nomenclature, reports, records, technical procedures, and methods for use within the military departments. It represents the Council in collaboration with other agencies of the Department of Defense in similar efforts toward uniformity.

Another important function of this Division is that of maintaining liaison with the Assistant Secretary of Defense (Manpower

(1) The third of four articles on the Armed Forces Medical Policy Council.

and Personnel), advising on all medical manpower problems and requirements for medical and dental officers for the 3 military departments.

Many actions have been taken by this Division which will in the end affect persons serving in Armed Forces medical and allied fields. Studies have been conducted which will result in uniformity of grade of rank of special registrant physicians,

Figure 1. Military Affairs Coordination Division, Armed Forces Medical Policy Council. Left to right: Colonel Theodore C. Bedwell, Jr., USAF (MC), Staff Assistant; Rear Admiral John Q. Owsley, MC, USN, Chief of Division; and Colonel William W. Roe, Jr., MC, USA, Staff Assistant.

taking into consideration their length of professional experience. Uniformity and length of tours of duty and promotion policies within the 3 services have also received action. A recent directive has been issued establishing uniform service requirements following internship and residency training. A policy has been extended throughout the Department of Defense on the use of registered nurses to assure insofar as practicable that they be used for professional duties only. Studies by the division and the committees which preceded it have resulted in the establishment of the Armed Forces Medical Publication Agency, the Armed Forces Institute of Pathology, the Armed Forces Epidemiological Board, and the Armed Forces Medical Library. An experimental program has recently been inaugurated in several medical schools to provide basic military medical education in the curriculum. Medical care of dependents of Armed Forces personnel is receiving continuous and thorough study.

Due to the critical shortage of medical and dental personnel required to care for the health needs of the Armed Forces, the Department of Defense has recently adopted the policy of considering all physicians, dentists, and veterinarians potentially acceptable for military service provided they can reasonably be expected to be productive in the Armed Forces and as a result the military departments were directed to re-evaluate such previously disqualified personnel. In addition, studies have been conducted and recommendations made by this Division resulting in proposed revisions of Public Law 779 (the "Doctor Draft Act") for presentation to other agencies of the Department of Defense.

IV. Civil and Military Interrelations Division *(1)*

THE Civil and Military Interrelations Division of the Armed Forces Medical Policy Council (fig. 1) coordinates and integrates military medical activities with civilian medicine and with governmental agencies outside the Department of Defense. Therefore, the mission of this Division requires that most of its activities be directed toward participation in joint studies with other agencies in order that policies reflecting the combined opinions of both civilian and military authorities may be evolved. An example of such military medical contribution to national policy is the position of the Armed Forces Medical Policy Council in the National Blood Program. The National Blood Program encompasses the Armed Forces Blood Program together with that of the Federal Civil Defense Administration and that of the American National Red Cross. This Division also provides the necessary staff studies on which the Council establishes policy for operational procedures of the blood programs of the 3 military departments.

Another function of the Civil and Military Interrelations Division is to review and comment on all legislation having military medical and health implications whether such legislation originates within the Department of Defense, any of the 3 medical services, or within Congress.

Much of the activity of the Division is a matter of liaison with civilian medical interests and agencies. This relationship underlies many of the broad policies concerning the use of medical specialists in the military services. Such liaison also provides high level representation for military medicine in problems of

(1) The last of four articles on the Armed Forces Medical Policy Council.

national research and in national health programs. Military medical interests are thus represented in the National Institutes of Health, the National Research Council, and the Armed Forces Research and Development Board. In general, the Civil and Military Interrelations Division is the agency through which the joint medical

Figure 1. Civil and Military Interrelations Division, Armed Forces Medical Policy Council. Left to right: Captain Benjamin G. Feen, MC, USN, Staff Assistant; Brigadier General Alvin L. Gorby, MC, USA, Chief of Division; and Colonel Harry G. Moseley, USAF (MC), Staff Assistant.

policies of the Departments of the Army, Navy, and Air Force are coordinated with the policies and principles of American medicine and with the segments of national interests entrusted to other governmental agencies.

BOOK RECEIVED

Syphilitic Optic Atrophy, by *Walter L. Bruetsch,* M. D., Clinical Professor of Neurology and Psychiatry, Indiana University School of Medicine; Clinical Director and Head of the Research Department, Central State Hospital, Indianapolis, Ind.; Special Consultant to the U. S. Public Health Service, Division of Venereal Diseases, Washington, D. C. American Lecture Series, Publication No. 142, A Monograph in the Bannerstone Division of American Lectures in Ophthalmology, edited by *Donald J. Lyle,* M. D., F. A. C. S., Professor of Ophthalmology, College of Medicine, University of Cincinnati, Cincinnati, Ohio. 138 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1953. Price $5.50.

TREATMENT OF PULMONARY COMPLICATIONS SECONDARY TO UPPER RESPIRATORY INFECTIONS[1] [2]

ROBERT DENTON, *First Lieutenant, USAF (MC)*
ERNEST A. KELLER, *Captain, USAF (MC)*
ARCHIE A. HOFFMAN, *Lieutenant Colonel, USAF (MC)*
JULIAN A. JARMAN, *Colonel, USAF (MC)*

FROM a medical standpoint, acute upper respiratory infections at present have the second greatest impact on the personnel effectiveness of the Air Force. As officially reported (3), they are surpassed in incidence only by "injuries and their residual conditions." Respiratory tract infections are second as a cause of time loss from duty for treatment, but are first as a cause of admission to Air Force hospitals. During the winter of 1951-1952 at this hospital, respiratory infections were responsible for 2,469 admissions for treatment. The average length of hospitalization of these patients was 5.77 days.

The attending physicians remarked on the high incidence of a nonproductive cough which persisted after the cessation of initial symptoms and signs of upper respiratory tract disease. This implication for involvement of the lower respiratory tract in many of these patients, together with recently reported statistics (3), was responsible for the initiation of the clinical trial of a new continuous aerosol technic known as mist-O_2-gen therapy.

APPARATUS AND RATIONALE

Mist-O_2-gen therapy as described by Denton and Smith (4), uses a metal nebulizer (fig. 1) to generate large volumes of nebulized particles in combination with therapeutic concentrations of oxygen. This moisture-laden, or supersaturated, atmosphere is contained within a small oxygen head tent. During ambient breathing, the patient's respiratory exchange carries

(1) This project was accomplished with equipment supplied by, and parts reproduced with the permission of, the Mist-O_2-gen Equipment Division, Production Foundry Co., Oakland, Calif.

(2) U. S. Air Force Hospital, Sheppard Air Force Base, Tex.

(3) Noneffectiveness. U. S. Air Force Med. Ser. Dig. 2: 17-19, Dec. 1951.

(4) Denton, R., and Smith, R.: Portable humidifying unit; large-capacity metal nebulizer. Am. J. Dis. Child. 82: 433-438, Oct. 1951.

and distributes this moisture throughout the entire tracheobronchial tree. Widespread penetration of the mechanically suspended liquid phase insures liquefaction and subsequent expulsion of retained secretions which materially aid in the maintenance of the physiologic drainage of the bronchopulmonary system.

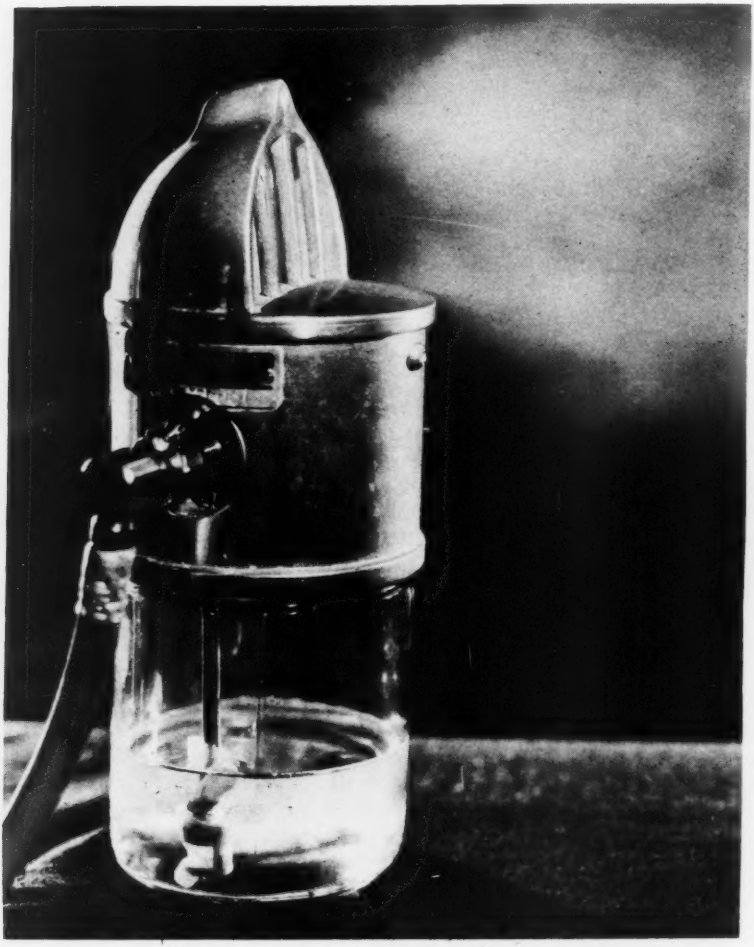

Figure 1. Side view of metal mist-O_2-gen nebulizer with oxygen hose attached. Note the aerosol mist.

Early experience with adult patients demonstrated the need for certain changes in the design of the open-top mist-O_2-gen tent. Various positions of the patient in bed were considered necessary to obtain optimum results. Consistently high oxygen concentrations were maintained in the pediatric mist-O_2-gen tent because of the gastight seal of the plastic tent material around the child's abdomen *(4)*. In the adult, the oxygen seal is formed at the base of the patient's neck. In this area, a plastic tent collar-to-skin seal is easily secured with a soft elastic bandage which passes under the arms (fig. 2). To accommodate the tent

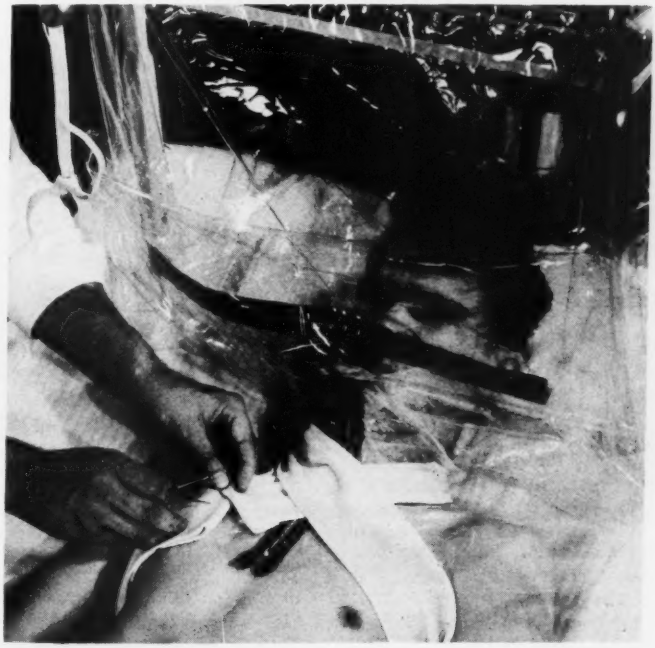

Figure 2. Photograph showing the seal of the plastic tent material around the base of the patient's neck.

to changing positions of the adult patient, the supporting frame, which rested on the bed in the pediatric unit, was suspended from a single, overhead, supporting bracket by the adjustable 4-point suspension (fig. 3). Two small zippered openings are included in the front tent wall to allow access to the patient and to facilitate placement of the patient's head within the tent. Temperature control is maintained by an aluminum ice cooler suspended in the

upper rear of the tent enclosure (fig. 3). The desired concentration of aerosol is collected initially with the open top of the tent covered with plastic material. When the density of aerosol is adequate, the top cover, except the portion covering the ice cooler, may be removed. This prevents room air from entering the tent and diluting the oxygen-aerosol mixture.

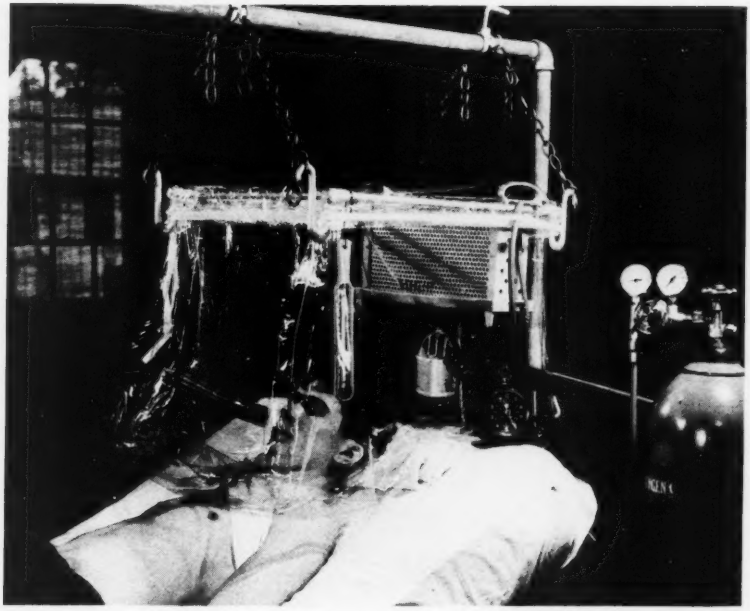

Figure 3. Patient prepared for treatment. Note position of the aluminum ice cooler, adjustable supporting bracket, and patient's head within the tent enclosure.

In continuous oxygen-aerosol therapy in certain types of bronchopulmonary disease, it should be remembered that the normal tracheobronchial tree has both drainage and ventilatory functions. Drainage is facilitated by the lengthening and widening of the bronchi and bronchioles in inspiration and by their shortening and narrowing in expiration *(5, 6)*. Normal ciliary function is essential for this process *(6)*. In the presence of infection, accumulation of secretions and mucosal edema of the bronchi and segmental bronchioles both play a major role in obstruction of the

(5) Levine, E. R., and Klein, W. S.: Physiological respiratory changes associated with bronchial infections. Ann. Otol. Rhin. & Laryng. 58: 1148-1154, Dec. 1949.
(6) Garthwaite, B., and Barach, A. L.: Penicillin aerosol therapy in bronchiectasis; lung abscess and chronic bronchitis. Am. J. Med. 3: 261-293, Sept. 1947.

respiratory tract (7). These factors result in deficient drainage of the tubular system which, in turn, produces a decrease in the total ventilatory capacity of the lung. Progressive obstruction may lead to atelectasis and pulmonary damage. By the continuous deposition of aerosol on the bronchopulmonary mucosa, liquefaction and expulsion of secretions and control of edema occur. An increase in the total ventilatory capacity follows adequate drainage and optimal conditions for reduction of the inflammatory process are maintained.

CLINICAL TRIAL

An initial experience with acute bronchopulmonary infection in adults has been analyzed from a preliminary group of 20 patients with lower respiratory tract inflammation secondary to acute upper respiratory infection. Localized pneumonitis and acute bronchitis, singly and in combination, are represented (table 1). This group was compared with 20 patients who received similar treatment omitting mist-O_2-gen therapy (table 2).

In the treated group, mist-O_2-gen therapy was started at the onset of definite lower respiratory tract symptoms and signs. The aerosol solution contained 2.5 percent glycerin, 2.5 percent propylene glycol, and 0.25 percent phenylephrine in a base of distilled water. During a 24-hour period, about 1 liter of this solution was nebulized into the head tent enclosure at an average oxygen flow of 8 liters per minute. Treatment was continued until the patient was asymptomatic and the chest was clear on examination.

RESULTS

Although the average period from the onset of severe symptoms to clearing of the chest in the mist-O_2-gen-treated group was shorter by 3 days than that for the control group, this difference is not statistically significant. The patients receiving mist-O_2-gen therapy were rapidly relieved of cough and chest pain. The harsh, persistent, nonproductive cough was converted, within 2 or 3 hours, to a loose cough productive of large amounts of thin, mucopurulent sputum. There was no question in the minds of the observers but that the procedure was clinically worth while.

DISCUSSION

At this stage in our experience with adults, it would appear that essentially the same satisfactory response as seen in chil-

(7) Holinger, P.; Basch, F. P.; and Poncher, H. G.: Influence of expectorants and gases on sputum and mucous membranes of tracheobronchial tree. J. A. M. A. 117: 675-678, Aug. 30, 1941.

TABLE 1. *Clinical results of mist-O_2-gen therapy in segmental pneumonitis and acute bronchitis*

Patient	Age (years)	Pulmonary complications	Leukocytes	Neutrophils (percent)	Lymphocytes (percent)	Mist-O_2-gen exposure (hours)	Days required for clearing
1	20	Pneumonitis, segmental	8,900	63	36	63	8
2	17	Pneumonitis, segmental	24,100	70	24	37.5	5
3	22	Pneumonitis, segmental	17,800	70	30	34	7
4	20	Pneumonitis, segmental	37,500	72	11	36	12
5	20	Pneumonitis, segmental	9,400	66	34	104	16
6	19	Pneumonitis, segmental	14,200	88	4	16	6
7	21	Pneumonitis, segmental	7,100	60	36	5	25
8	18	Pneumonitis, segmental	26,300	89	11	13	6
9	20	Pneumonitis, segmental and bronchitis, acute	13,000	78	21	52	14
10	20	Pneumonitis, segmental and bronchitis, acute	27,600	83	16	24	8
11	20	Pneumonitis, segmental and bronchitis, acute	14,200	82	18	64	9
12	21	Pneumonitis, segmental and bronchitis, acute	13,350	68	26	41	8
13	19	Pneumonitis, segmental and bronchitis, acute	10,600	67	31	64	8
14	20	Pneumonitis, segmental and bronchitis, acute	11,700	75	22	60	5

TABLE 1. *Clinical results of mist-O_2-gen therapy in segmental pneumonitis and acute bronchitis*—Continued

Patient	Age (years)	Pulmonary complications	Leukocytes	Neutrophils (percent)	Lymphocytes (percent)	Mist-O_2-gen exposure (hours)	Days required for clearing
15	21	Bronchitis, acute	13,000	82	18	38	6
16	21	Bronchitis, acute	9,050	80	10	80	8
17	21	Bronchitis, acute	14,850	59	29	22	6
18	20	Bronchitis, acute	10,600	80	20	61.5	11
19	42	Bronchitis, acute	7,200	65	40	16	2
20	20	Bronchopneumonia	11,700	68	32	85.5	16
						Average	9.3± 5.1*

*Standard deviation.

TABLE 2. *Clinical results in segmental pneumonitis and acute bronchitis (control group)*

Patient	Age (years)	Pulmonary complications	Leukocytes	Neutrophils (percent)	Lymphocytes (percent)	Days required for clearing
1C	21	Pneumonitis, segmental	27,200	89	11	10
2C	22	Pneumonitis, segmental	13,000	69	31	18
3C	19	Pneumonitis, segmental	9,160	61	34	5
4C	21	Pneumonitis, segmental	15,000	83	17	22
5C	21	Pneumonitis, segmental	13,400	63	32	10
6C	21	Pneumonitis, segmental	16,700	83	16	3
7C	20	Pneumonitis, segmental	18,700	80	20	11
8C	18	Pneumonitis, segmental	8,400	79	21	7
9C	20	Pneumonitis, segmental	36,250	89	9	14
10C	19	Pneumonitis, segmental	6,500	66	31	9
11C	18	Pneumonitis, segmental and bronchitis, acute	12,000	77	22	17
12C	19	Pneumonitis, segmental and bronchitis, acute	13,000	83	17	17
13C	20	Pneumonitis, segmental and bronchitis, acute	10,050	70	16	12

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TABLE 2. *Clinical results in segmental pneumonitis and acute bronchitis (control group)*—Continued

Patient	Age (years)	Pulmonary complications	Leukocytes	Neutrophils (percent)	Lymphocytes (percent)	Days required for clearing
14C	21	Pneumonitis, segmental and bronchitis, acute	15,000	61	39	11
15C	20	Bronchitis, acute	6,200	56	44	11
16C	20	Bronchitis, acute	14,200	63	38	13
17C	19	Bronchitis, acute	5,450	69	31	5
18C	18	Bronchitis, acute	9,300	72	22	14
19C	19	Bronchopneumonia	19,700	72	26	7
20C	23	Bronchopneumonia	18,200	80	15	26
					Average	12.1±5.6*

*Standard deviation.

dren *(4)* may be possible. Because of the limitations and nature of this study and the absence of adequate research facilities, it was not considered essential to determine the cause (viral?) of these infections.

SUMMARY

In this preliminary clinical study, 20 patients with bronchopulmonary complications secondary to upper respiratory infections were treated with a new technic in inhalational therapy. The clinical response obtained indicates the desirability of more exhaustive studies. The treatment produced an apparent shortening of the clinical course of the disease, a reduction in hospital days, and more rapid rehabilitation of the patient.

BOOKS RECEIVED

Problems of Infancy and Childhood, Transactions of the Sixth Conference March 17 and 18, 1952, New York, N. Y., edited by *Milton J. E. Senn,* M. D., Sterling Professor of Pediatrics and Psychiatry, Yale University School of Medicine, New Haven, Conn. Sponsored by the *Josiah Macy, Jr. Foundation,* New York, N. Y. 160 pages. Printed by Foundation Press, Inc., Packanack Lake, N. J., 1953. Price $2.50.

Mid-Century Psychiatry, An Overview, edited by *Roy R. Grinker,* M. D., Director of Institute for Psychosomatic and Psychiatric Research and Training, Michael Reese Hospital, Chicago, Ill. 183 pages. Charles C Thomas, Publisher, Springfield, Ill., 1953. Price $5.50.

Diabetic Manual for the Doctor and Patient, by *Elliott P. Joslin,* M. D., Sc. D., Clinical Professor of Medicine, Emeritus, Harvard Medical School; Medical Director, George F. Baker Clinic at New England Deaconess Hospital; Consulting Physician, Boston City Hospital; Honorary President, International Diabetes Federation; Honorary President, American Diabetes Association. 9th edition. 315 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1953.

Human Factors in Air Transportation, Occupational Health and Safety, by *Ross A. McFarland,* Ph. D., Associate Professor of Industrial Hygiene, Harvard School of Public Health. 830 pages; illustrated. McGraw-Hill Book Co., Inc., New York, N. Y., publishers, 1953. Price $13.

Synovial Fluid Changes in Joint Disease, by *Marian W. Ropes,* M. D., Associate Physician, Massachusetts General Hospital; Assistant Clinical Professor of Medicine, Harvard Medical School, and *Walter Bauer,* M. D., Chief of Medical Services, Massachusetts General Hospital; Jackson Professor of Clinical Medicine and Director of Robert W. Lovett Memorial Foundation for the Study of Crippling Disease, Harvard Medical School. 150 pages; illustrated. Harvard University Press, Cambridge, Mass., 1953. Price $4.

THE PRACTICAL VALUE OF CARDIOPULMONARY FUNCTION TESTS[1]

ARTHUR A. SIEBENS, *Lieutenant, junior grade, MC, USNR*
MELVIN M. NEWMAN, *Lieutenant, MC, USNR*
GRAFTON A. SMITH, *Lieutenant, junior grade, MC, USNR*
CLIFFORD F. STOREY, *Captain, MC, USN*

THE importance of an accurate assessment of cardiopulmonary function has been greatly enhanced within recent years by the development of therapeutic methods which offer much in the improvement or correction of certain impairments of the heart and lungs. As a result, numerous technics applicable to the precise measurement of cardiopulmonary function have been developed. These tests have become so numerous, and in some instances so intricate, that their practical clinical value appears to have been fully appreciated only by those intimately associated with the study and treatment of disorders which interfere with the function of the heart-lung apparatus. The practical clinical value of some of the cardiopulmonary function tests is illustrated in this article by a few selected cases.

CASE REPORTS

Case 1. A 47-year-old man was admitted to this hospital in May 1951 complaining of cough, wheezing, and dyspnea of 20 years' duration. He had had increasing shortness of breath and occasional diffuse chest pain for the preceding 5 years. Physical examination showed an obese, markedly emphysematous man who had dyspnea on slight exertion. Numerous loud rhonchi and expiratory wheezes could be heard over most of his chest. Roentgenograms showed pronounced flattening of the diaphragm and marked radiolucency of the lungs (figs. 1 and 2). The ECG was within normal limits. Bronchoscopic examination revealed marked hyperemia, hypertrophy, and redundancy of a bronchial mucosa which was covered by thick secretions. Treatment with bronchodilators and penicillin resulted in a little improvement.

(1) From the U. S. Naval Hospital, St. Albans, N. Y.

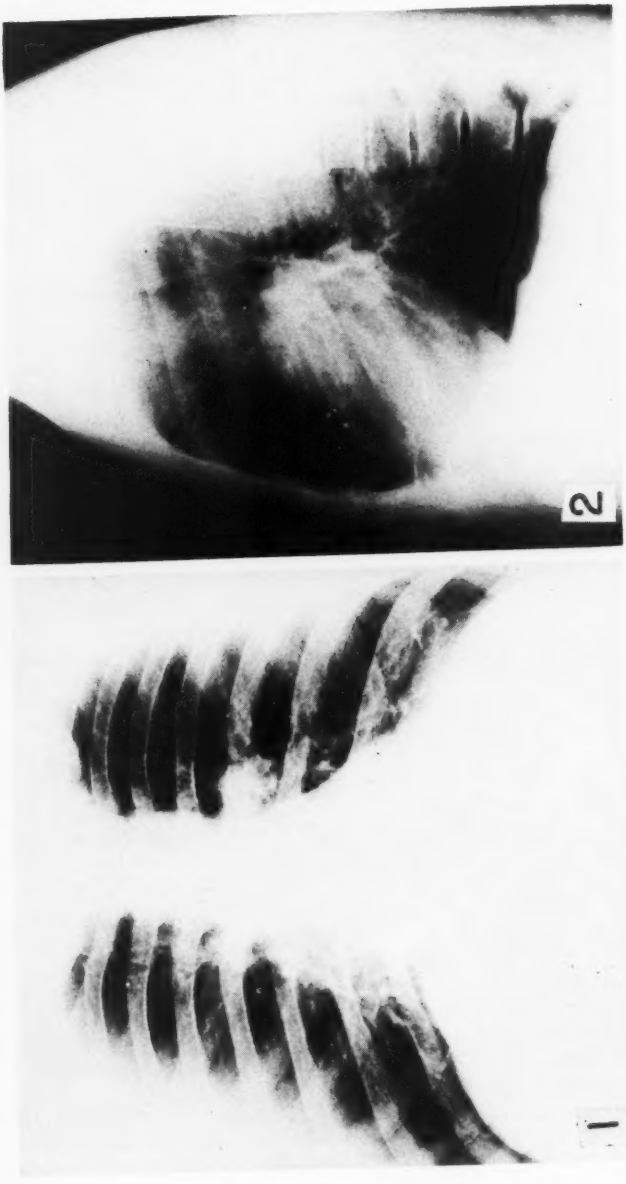

Figure 1 (case 1). Posteroanterior roentgenogram. Note enlarged intercostal spaces, flattened diaphragm, and radiolucency of lungs.
Figure 2 (case 1). Lateral roentgenogram. Note increased anteroposterior diameter of chest and flattened diaphragm.

Comment. The results of function tests in this patient are summarized in figure 3. These studies supplement the estimates of the patient's emphysema derived from physical examination and roentgenography. They show hyperventilation on exercise and walking, impaired maximum breathing capacity, diminished vital capacity, elevated residual air, failure to reduce the alveolar

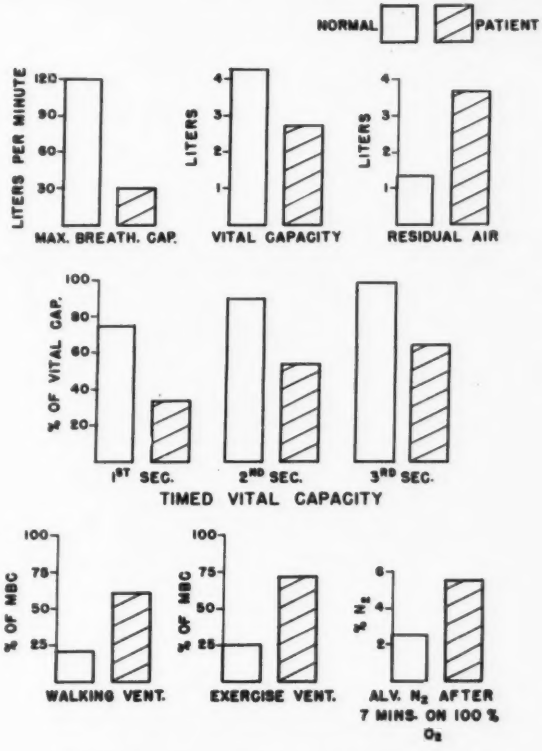

Figure 3 (case 1). Summary of function tests.

nitrogen to normal levels after breathing 100 percent oxygen for 7 minutes, and inability to expel air rapidly as demonstrated by the poor performance on the timed vital capacity test. These abnormalities form a characteristic constellation, the individual values of which quantitate the elements of overdistention and obstruction which characterize emphysema. In spite of the magnitude of the observed changes, the essential functions of respiration, i. e., oxygenation of hemoglobin and removal of carbon dioxide, remained near normal (oxygen saturation 93 percent;

Figure 4 (case 2). Preoperative roentgenogram of chest. Note almost complete opacity of left side of chest due to thickened pleura and fluid. Figure 5 (case 2). Roentgenogram of chest after decortication of left lung.

CO_2 content, 54.4 volumes percent). As these functions also fail, the present data will become a point of reference for charting the progress of the patient's illness.

Case 2. A 20-year-old man was in good health until he developed a cold and cough in late March 1952. After ambulatory treatment with sulfonamides he felt temporarily better. His fever returned, however, and he was hospitalized on 18 April with a

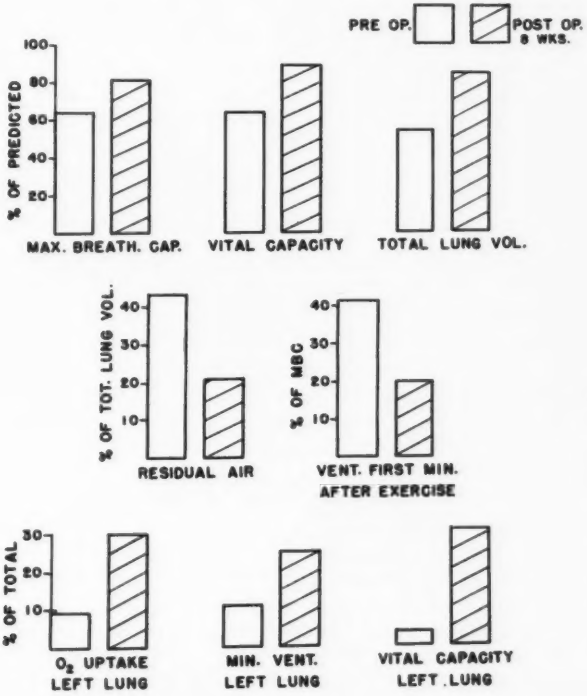

Figure 6 (case 2). Summary of function tests.

temperature of 104° F. and pleuritic pain in the left lower portion of his chest. A diagnosis of lobar pneumonia was made. After treatment with oxygen and aureomycin he became afebrile, but his chest pain persisted. Empyema was then demonstrated by roentgenograms and confirmed by thoracentesis. When transferred to this hospital the patient had lost 30 pounds in weight. He noticed dyspnea on moderate exertion. It was found that the left side of his chest was flattened and failed to expand. His breath sounds were almost inaudible. Bronchoscopic examination showed

no abnormality. Thoracentesis yielded creamy pus which was sterile on smear and culture for both acid-fast bacilli and pyogenic organisms. On 12 August a surgical decortication of the left lung and parietal pleura was performed. The entire visceral and parietal peel was removed. The lung expanded well following operation and there was no further accumulation of fluid. Pre- and post-operative roentgenograms of his chest are shown in figures 4 and 5, respectively.

Comment. The function tests summarized in figure 6 graphically portray the results after cure of the empyema by decortication. As in case 1, pulmonary function data were not required for a convincing estimate of the patient's clinical status; the physical and fluoroscopic indications of improved ventilation on the left were striking. These impressions reflect the increase in maximum breathing capacity, vital capacity, and total lung volume which were measured. In addition, a drop in residual air to normal levels, indicating restoration of normal pulmonary volumetric relationships, and an improved tolerance for exercise were recorded.

Ventilation must be correlated with exchange of respiratory gases if it is to be reasonably evaluated. One of the practical problems of current interest concerns precisely this question. Is there a return of blood flow and oxygen consumption to a chronically restricted lung, the ventilation of which has been restored? The bronchospirometric data demonstrate the benefits of operation in terms of oxygen consumption in the re-expanded lung of this patient. It is, therefore, in providing an objective basis for evaluating therapy according to both ventilation and oxygen consumption pre- and post-operatively that pulmonary function tests have been of assistance in the study of this patient.

Case 3. A 25-year-old woman had had known pulmonary tuberculosis since 1947. After several types of therapy, a right pneumonectomy was performed in September 1950 for a destroyed right lung. The operation was followed by a persistent bronchopleural fistula and empyema. The latter was only partially controlled by thoracoplasty and the fistula remained open. After admission to this hospital bronchoscopy and bronchography (fig. 7) demonstrated long bronchial stumps and a fistula from the right upper lobe bronchus. After adequate function of the left lung had been verified and normal arterial oxygen saturation found, a reamputation of the right main stem bronchus and a Schede thoracoplasty were performed. Because of this patient's dubious clinical status, a major operation would have been undertaken only with reluctance had not the presence of adequate respiratory function in the residual lung been established preoperatively. The operation was well tolerated and there has been no post-operative respiratory embarrassment.

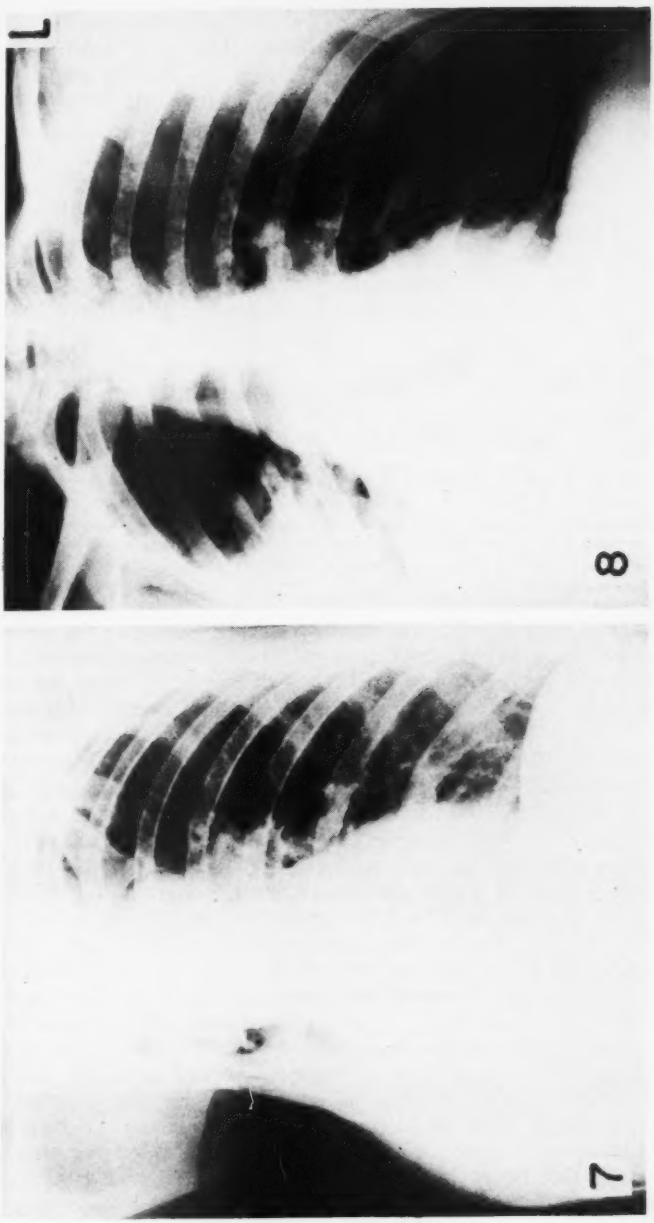

Figure 7 (case 3). Posteroanterior roentgenogram. The left lung appears normal. The stump of the right stem bronchus, filled with lipiodol, can be seen only faintly. Figure 8 (case 4). Roentgenogram of chest. There is complete collapse of the right lung with right pyopneumothorax. The left lung shows little residual abnormality after the extensive recent bronchopneumonia.

Case 4. A 24-year-old man developed a diffuse bilateral bronchopneumonia on 1 September 1952 while under treatment elsewhere. He failed to improve on antibiotic therapy and developed massive atelectasis of the right lung with marked dyspnea and cyanosis. Bronchoscopy on 10 October failed to demonstrate

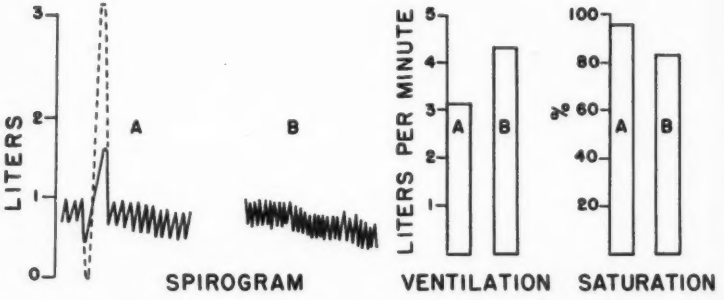

Figure 9 (cases 3 and 4). Comparison of function tests. A is case 3. B is case 4. Dotted curve in spirogram A delimits inspiratory and expiratory excursion in normal person of same sex, age, and height. Note normal saturation in spite of pronounced diminution in these volumes. Note unsaturation in B although ventilation is increased over A. Body surface area of the two patients was comparable.

intrabronchial obstruction. On the day of bronchoscopy he developed a spontaneous pneumothorax which was treated by closed catheter drainage without re-expansion of the right lung. He was transferred to this hospital on 17 October for further treatment. Repeated bronchoscopies showed no intrabronchial obstruction to account for the persistent atelectasis. There were copious purulent secretions coming from the left main stem bronchus and a smaller amount of pus on the right side. On bed rest, oxygen supplied nasally, and antibiotics he improved somewhat. His left lung remained clear on x-ray (fig. 8). His arterial blood was found to be from 83 to 86 percent saturated on room air (fig. 9) and rose to 100 percent on 100 percent oxygen. Because of the danger of spreading infection, both in his unexpandable, apparently destroyed right lung, as well as in his apparently functioning left lung, a right pneumonectomy was performed on 6 November. Difficulty in maintaining good oxygenation was encountered early in the course of the operation. Near the conclusion of the procedure, his color became progressively worse, his heart slowed, and his blood pressure failed. Despite intra-arterial transfusion, cardiac massage, and other supportive procedures he died. At autopsy there was massive bronchiectasis and extensive atelectasis of the left lung. The excised right lung showed total bronchiectasis.

Comment. The problems presented by cases 3 and 4 were similar in the following essentials: (1) both patients, in effect, had suffered the complete loss of one lung; (2) in each the remaining lung was functioning well as judged by clinical evaluation; and (3) thoracotomy on the diseased side was considered necessary for the improvement of each patient and for the preservation of their intact pulmonary tissue. They differed in one salient respect: patient 3 had a normal oxygen saturation but patient 4 remained unsaturated on room air. Inasmuch as this unsaturation could be corrected by high concentrations of oxygen, it could be ascribed to impaired diffusion on the left rather than to perfusion of inadequately ventilated alveoli on the right (shunting effect). The findings at bronchoscopy and necropsy were compatible with this impairment. Had this patient's diffusion characteristics been normal, as they were in patient 3, he should have withstood the operation uneventfully. In this comparison of 2 similar patients, then, the critical factor in an analysis of their contrasting outcome was the evidence of pulmonary pathology afforded by a laboratory determination of the arterial oxygen saturation.

Figwe 10 (case 5). Bronchogram showing extensive bilateral tubular bronchiectasis involving left lower lobe, lingula of upper lobe, and basilar segments of right lower lobe.

Case 5. A 22-year-old man was admitted to this hospital in August 1952 for repair of recurrent inguinal hernias. In the course of his evaluation it was learned that he had had a chronic cough for many years with production of about 30 cc. of thick, green sputum daily. Bronchograms revealed bilateral cylindrical bronchiectasis involving the right middle lobe and basilar segments of the right lower lobe, the lingula, and almost all of the left lower lobe (fig. 10). Bronchoscopy showed thick mucopurulent material coming from the bases of both lungs (somewhat more copiously from the right). Further questioning revealed that this man had noted increasing dyspnea on relatively mild exertion.

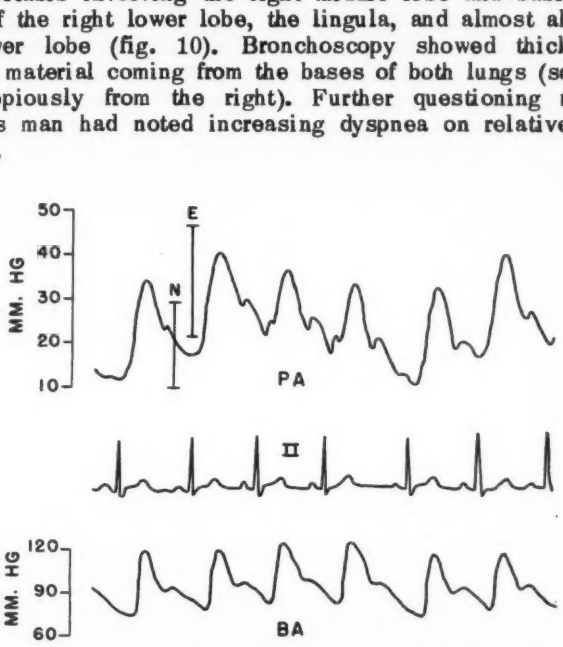

Figure 11 (case 5). The upper record shows pressures and pulse contours in the pulmonary artery (PA) *at rest. Normal limits of systolic and diastolic pressures at rest and exercise are indicated by* N. *Patient's mean systolic and diastolic pressures on exercise are indicated by* E. *The middle tracing shows lead II of his ECG. The lower record shows pressures and pulse contours in the brachial artery* (BA). *Note elevation of* PA *pressures at rest and exercise; effect of respiration on pressures and heart rate (sinus arrhythmia); and relationship of diastolic interval to pulse pressure.*

Comment. The results of cardiopulmonary function studies of this patient were critical in determining the choice of therapy. That the patient was somewhat emphysematous and moderately prone to exertional dyspnea could be deduced on clinical grounds. As in case 1, however, the laboratory contributed quantitative data and a point of reference in assessing the degree and progress of disease. The findings of unsaturation, not clinically detectable,

added much to the gravity with which the patient's condition was regarded and raised the likelihood of pulmonary arterial hypertension. Finally, the catheterization data completed the basic information essential to conclusive thinking relative to the therapeutic regimen.

As indicated in figure 11, the suspicion of pulmonary hypertension was borne out by pressure elevations both at rest and following a level of exercise sufficient to increase cardiac output only 155 percent *(2)*. Inasmuch as pressure is inversely related to cross-section area in a hydraulic system such as the lesser circulation *(3)*, and as the extent of pulmonary resection required for effective surgical treatment of this patient's bronchiectasis would severely diminish this area, it was concluded that such a course could be pursued only at the grave risk of increasing the hypertension to prohibitive levels. The patient was therefore referred to the medical service for conservative management.

SUMMARY

The practical value of selectively applied cardiopulmonary function tests in assessing clinical problems has been shown by 5 illustrative cases. Physiologic functions that can only be estimated by clinical methods can be quantitatively determined by procedures such as cardiac catheterization, yielding information of crucial importance for diagnosis and therapy.

(2) Normal persons undergoing exhaustive exercise have withstood 300 percent increments of cardiac output without elevations of pulmonary arterial pressure (data from Dr. Cournand's laboratory).

(3) By Poiseuille's law: $P = \frac{8L}{\pi R^4} vI$. Where P is the pressure difference between 2 points, L and R are the length and radius respectively of the fluid-containing medium, v is the fluid viscosity, and I its volume flow per unit time.

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Group Psychotherapy, Studies in Methodology of Research and Therapy; Report of a Group Psychotherapy Research Project of the U. S. Veterans Administration. by *Florence B. Powdermaker*, Ph. D., M. D., Responsible Investigator, and *Jerome D. Frank*, Ph. D., M. D., Principal Assistant. In collaboration with *Joseph Abrahams*, M. D.; *Albert E. Dreyfus*, M. D.; *Henry S. Maas*, Ph. D.; *Robert MacGregor*, M. A.; *Joseph B. Margolin*, M. A.; *Helen T. Nash*, B. A.; *Morris B. Parloff*, M. A.; *David Rosenthal*, Ph. D.; and *Edith Varon*, M. A., M. S. 615 pages. Harvard University Press, Cambridge, Mass., publishers, 1953. Price $6.50.

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GASTRIC DIVERTICULUM AND THE TRANSTHORACIC APPROACH

JAMES B. SEAMAN, *Lieutenant Colonel, MC, USA*

THE surgical treatment of gastric diverticulum should receive more serious consideration. The transthoracic approach in the treatment of a fundic diverticulum or one near the cardia has definite advantages.

INCIDENCE

Bralow and Spellberg *(1)* found the incidence of gastric diverticulum to be 0.015 percent of total hospital admissions. Up to 1936 no case had been diagnosed preoperatively at the Johns Hopkins Hospital and only 4 were found by pathologists there *(2)*. Of 20,000 admissions per annum to the University Hospital, St. Louis, Mo., for the years 1942-1952, no case was reported *(2)*; and of 700,000 admissions to Los Angeles County General Hospital (1929 to 1945) only 6 such cases were seen *(3)*. The total experience in these 2 large teaching hospitals of almost a million patients included but 6 patients with gastric diverticulum. To most doctors, therefore, this entity is encountered but "once in a lifetime."

ETIOLOGY

Suggested causes of this outpouching are weakness, especially that present in the portals provided for arterioles and venules; thinning of muscular layers; regurgitation; benign and malignant ulcerations; infection; gastric distention; and perigastritis associated with traction from without. In a few patients there appears to be an associated peptic ulcer, irritable colon, or gallbladder disease.

DIAGNOSIS

Symptoms and signs. Bralow and Spellberg believed that the clinician is primarily concerned with the extent to which existing symptoms are due to the diverticulum; that the symptoms and

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(1) Bralow, S. P., and Spellberg, M. A.: Diverticula of stomach; report of 26 new cases. Gastroenterology 11: 59-82, July 1948.

(2) Casberg, M. A.: Diagnosis and treatment of gastric diverticula. Postgrad. Med. 11: 398-403, May 1952.

(3) Casberg, M. A., and Martin, W. P.: Gastric diverticula. Am. J. Surg. 76: 172-181, Aug. 1948.

signs are not characteristic; that diagnosis is radiologic and gastroscopic; that the condition is frequently asymptomatic; and the presence of a diverticulum should not be accepted as the sole factor accounting for the patient's symptoms. Such symptoms may include belching, vomiting, heartburn, loss of weight, epigastric tenderness, periodic substernal pain, melena, gastric hemorrhage, weakness, vertigo, and dysphagia, Ferguson and Cameron (4) mentioned the intermittent character of the discomfort. Low midline thoracic back pain, probably due to involvement of the pancreas by inflammation extending from the diverticulum, has been described by Telford (5).

X-ray. Of 267 cases discovered during life, 249 were found by roentgenography, 12 at operation, and 6 by gastroscopy (6). Bralow and Spellberg list roentgenographic requirements as follows: (1) mobile sac unattached to extragastric tissues; (2) well-defined, smooth shadow noted from various angles; (3) generally no tenderness in area of sac; (4) demonstration of rugas in neck of sac; (5) characteristic location at lesser curvature and posterior wall near cardia; (6) retention of barium for from 6 to 24 hours; and, (7) occasionally, ability to empty sac by change of position.

Gastroscopy. Bralow and Spellberg believed that gastroscopy is required to differentiate a diverticulum from a gastric ulcer. Gastroscopy should not be used in a patient with a cardiac diverticulum because of the danger of perforation, but every diagnostic means available should be used when the diverticulum is located in other areas (7). The gastroscope is essential when x-ray studies fail to differentiate a diverticulum from a benign ulcer, an excavated tumor, or a postoperative deformity (6). Tracey and Colcock (8) believed that the gastroscope is useful in the gastric body or antrum but not so in cardiac or fundic areas and that "a surgeon capable of exposing this inaccessible area should be available." Definite needs for gastroscopy are to determine if blood may be coming from the diverticulum or elsewhere and to find out whether or not the remainder of the stomach is normal (9).

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(4) Ferguson, L. K., and Cameron, C. S., Jr.: Diverticula of stomach and duodenum; treatment by invagination and suture. Surg., Gynec. & Obst. 84: 292-300, Mar. 1947.

(5) Telford, D.: Diverticula of stomach. Canad. M. A. J. 50: 526-529, June 1944.

(6) Palmer, E. D.: Gastric diverticula. Surg., Gynec. & Obst. (Internat. Abstr. Surg.) 92: 417-428, May 1951.

(7) Brown, C. H.; Bissonnette, R. P.; and Albee, R. D.: Diverticula of stomach; report of 30 cases and review of literature. Gastroenterology 12: 10-23, Jan. 1949.

(8) Tracey, M. L., and Colcock, B. P.: Gastric diverticulum; diagnosis and indications for surgical excision. Gastroenterology 18: 165-169, June 1951.

(9) Whitehouse, F. R., and MacMillan, J. M.: Gastric diverticulum; gastroscopic observation of 2 cases. Gastroenterology 3: 13-22, July 1944.

COMPLICATIONS

Hemorrhage is the most common complication, others being rupture, torsion and gangrene, and possibly malignant degeneration *(7)*.

TREATMENT

Medical treatment includes bland diet, antispasmodics, alkalies, gastric lavage, and postural drainage. Such associated conditions as duodenal ulcer, irritable colon, and gallbladder disease should be treated *(7)*.

The *indications for operation* vary according to the preferred approach to the cardia and the posterior wall of the stomach. We believe that the rule of placing the incision over the site of the lesion should clarify the indications and that as advances are made in surgical technic more of these diverticulums will be treated surgically rather than by indirect methods of observation, drugs, and diet.

Many able physicians *(1, 4, 8)* have stated that if a good medical regimen is faithfully pursued and symptoms persist, surgical repair is indicated. Others *(7)* have stated that the possibility of malignancy must be eliminated. This demands total excision of the lesion including a rim of normal tissue. Casberg *(2)* stated that retention is probably the greatest indication for resection. Ferguson and Cameron required that symptoms be stubborn and the sac be large. There is an alleged inherent tendency for irritative lesions of the stomach to become malignant and, if the lesion simulates malignancy, operation is obligatory. This fact and stasis, predisposing to a focus of infection, are the guideposts recommended by Ficarra *(10)*. Frank *(11)* having treated a 71-year-old woman with such a lesion believed that recommending operation for all patients is radical advice in a condition "which is usually harmless and nothing more than an x-ray oddity in the overwhelming majority." Because of inaccessibility abdominally Lahey *(12)* believed that operation should be performed only as a last resort. Michel and Williams *(13)* mentioned peridiverticulitis as an indication for operation. That condition may be secondary to a gastric ulcer, which in itself requires prompt resection.

(10) Ficarra, B. J.: Gastric diverticula. Am. J. Surg. 75: 570-574, Apr. 1948.

(11) Frank, L. L.: Diverticulum of stomach; case report. Am. J. Roentgenol. 52: 510-513, Nov. 1944.

(12) Lahey: Quoted in footnote reference *(13)*.

(13) Michel, M. L., Jr., and Williams, W. T.: Tri-locular gastric diverticulum; treated by surgical extirpation through thoraco-abdominal incision. Ann. Surg. 132: 273-281, Aug. 1950.

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Tracey and Colcock *(8)* urged operation when (1) neoplasm is suspected, (2) obstructive symptoms are present (diverticulum in distal stomach), (3) ulceration, uncontrollable by medical management, is suspected, (4) hemorrhage occurs twice without other source, or (5) medical treatment has failed.

SURGICAL TECHNIC

Advantages of thoracic approach. When the diverticulum is approached through the abdominal wall the gastrohepatic or gastrocolic ligament, or both, must be incised and much retraction and tugging is required to visualize the posterosuperior wall of the stomach as well as to accomplish a repair. Even so, it may be necessary to open the stomach and search for an ostium. In the 5 patients reported by Bralow and Spellberg, 3 diverticulums could not be located via this route. In the patient reported by Tracey *(14)* "the question of malignancy was considered but operation was thought inadvisable because of the inaccessibility of the involved area." Of the 5 diverticulums reported by Walters *(15)*, approached through upper left rectus incisions, 1 was located so high and was so inaccessible that an inversion rather than an excision was performed. In this case the postoperative roentgenograms showed no evidence of inversion. In a second patient the diverticulum was not found at the original operation (laparotomy).

Paulson *(16)* was the first to use the transthoracic approach to this lesion. Of 34 patients undergoing operation for gastric carcinoma, one-half were approached by laparotomy and the other half by thoracotomy or combined thoracotomy and celiotomy. He compared the shock-producing effects of both methods of entry. The thoracic method was definitely less productive of shock because of the lighter level of anesthesia required and the exertion of less pressure and tension on the large vessels and plexuses. Greenfield *(17)* advocated the thoracico-abdominal approach because of the accessibility, completeness of exposure, lessened danger of hemorrhage (the left and short gastric vessels can be divided under direct vision), lessened shock, lighter plane of anesthesia, and lessened total amount of anesthetic used. The immediate postoperative involution was also less tumultuous. A pure transcostal, transdiaphragmatic route can be even more advantageous because, when dealing with some lesions of the fundus or cardia, it is not necessary to go across the costochondral arch.

Definitive surgery. A nasogastric tube must be in place to deflate and inflate the stomach and the diverticulum, otherwise the

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(14) Tracey, M. L.: Gastric diverticula. Gastroenterology 1: 518-531, May 1943.

(15) Walters, W.: Diverticula of stomach. J. A. M. A. 131: 954-956, July 20, 1946.

(16) Paulson, D. L.: Transthoracic gastric surgery with report of transthoracic resection of diverticulum of stomach. J. Thoracic Surg. 13: 518-522, Dec. 1944.

(17) Greenfield, J.; Rossett, N. E.; and Mendel, W. H.: Gastric diverticula. Arch. Surg. 60: 65-74, Jan. 1950.

evagination may be missed. Inflation is of immense help and may be compared to the value of tension in dissection elsewhere *(7)*.

Bralow and Spellberg *(1)* favored total excision with inversion of the stump. Aseptic inversion was preferred by Ferguson and Cameron *(4)*. Paulson *(16)* recommended the closed method using a clamp. Being desirous of removing and not hiding pathologic lesions, of accurate hemostasis, and of approximating normal tissue in layers, we delineate the diverticulum accurately, excise the lesion with a rim of normal wall, achieve hemostasis with fine forceps and ligatures, and close the defect in the mucosa (easily separable in the fundus) with interrupted catgut and the remaining layers with interrupted fine silk sutures. The completeness of hemostasis can be further tested by lavage through the nasogastric tube.

CASE HISTORY

A 26-year-old woman was seen on 28 May 1952. A diagnosis of probable peptic ulcer was made. Her gastric acidity was normal. Roentgenograms revealed a diverticulum below the cardia (figs. 1 and 2). She was treated medically but by 2 July there was no relief and she was referred for surgical consultation. At the time of transfer to the surgical service on 12 July her nausea, pyrosis,

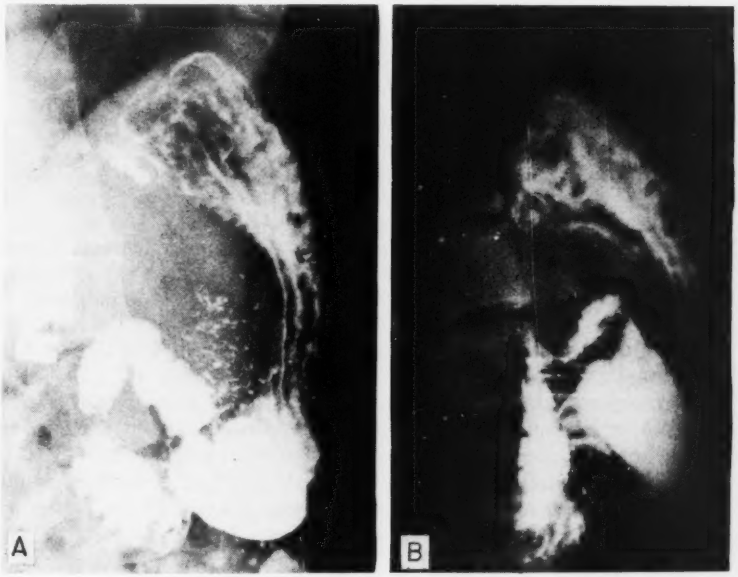

Figure 1. Preoperative roentgenograms showing location of diverticulum. (A) *Oblique view.* (B) *Lateral view.*

and mild epigastric pain had been present for 6 months. She had vomited "coffee ground" material twice. She denied the use of tobacco and alcohol but admitted overindulgence in coffee. One brother had an apparently benign gastric ulcer. Examination was negative except for moderate epigastric tenderness.

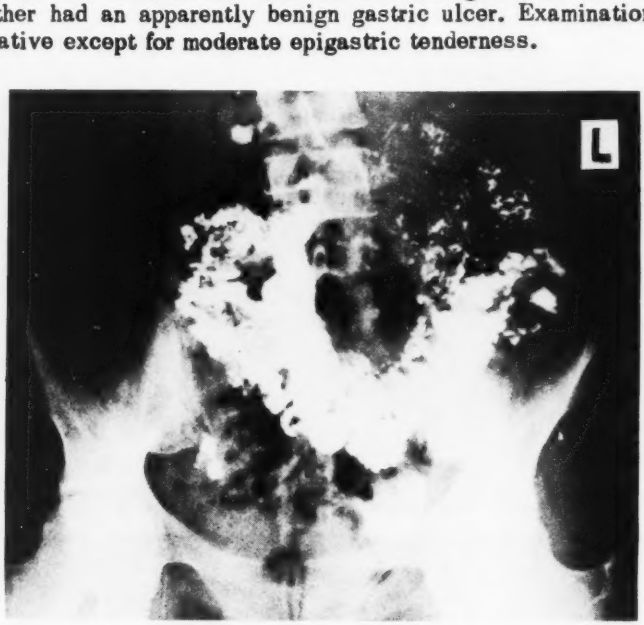

Figure 2. Preoperative roentgenogram showing residual barium in diverticulum.

On 14 July she was operated on. An incision was made through the left eighth rib bed. Exploration of the left lung, chest wall, and hilus was negative. The pulmonary ligament was divided to facilitate collapse and retraction of the left lung. The left hepatic lobe, stomach, and the spleen could be located by palpation through the diaphragm, which was opened. The abdomen was explored. The superior 4 cm. of the gastrosplenic ligament was divided; stay sutures were placed in the stomach; and the stomach was rotated clockwise through an arc of less than 45°. By means of a nasogastric tube the stomach was inflated slightly and gently, and the diverticulum was quickly and easily identified on the posterior wall, near the lesser curvature, about 4 cm. from the cardia. The lesion measured 3 by 2 cm. and had a neck less than 1 cm. in diameter. A traction suture was placed at the summit of the lesion and filmy vascular connections were severed. Using a scalpel, the sac was excised to include a rim of normal mural tissue.

Histologic studies revealed the mucosa to be normal and gastric in type, and the muscle component to be only one layer in thickness. There was no ulcer, no bleeding point, and no sign of malignant change. The gastric incision was closed and it was determined that closure had not embarrassed the stomach or cardia. The stomach was then released to regain its normal habitat. The diaphragm and chest wall were closed around a thoracostomy catheter. Every 30 minutes during operation the lung was fully expanded and prior to chest wall closure the pleural cavity was thoroughly lavaged. At the time of closure, intercostal block with efocaine was induced.

Because of sensitivity, no chemotherapeutic or antibiotic agent was used. The patient was discharged on 22 July. In August she complained of pyrosis and was admitted to the hospital on 11 September. An internist stated that her symptoms were not due to the gastric diverticulum because they had remained unchanged postoperatively and that the operation may have been harmful in that it reinforced the idea that she had something seriously wrong. She was discharged after 2 days' observation. In October she came to see me and said that she was a "new woman," and had gained 12 pounds. She was improved in every way and there was no doubt of her sincerity. There was no intercostal neuralgia and no symptoms of pleural irritation. Chest expansion was unimpeded and symmetric.

CONCLUSIONS

More lesions of organs located under the diaphragm should be explored and treated at an earlier date. The transthoracic or thoracico-abdominal approach is strongly advocated. Surgery is diagnostic, prophylactic, and therapeutic and it is indicated in most patients with a gastric diverticulum after thorough study and a brief (6 weeks) trial period of observation and treatment.

BOOK REVIEWS

The Medical Annual, A Year Book of Treatment and Practitioners' Index, by 42 contributors. Edited by Sir *Henry Tidy,* K. B. E., M. A., M. D. (Oxon), F. R. C. P., and *A. Rendle Short,* M. D., B. S., B. Sc., F. R. C. S.; 70th year. 444 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1952.

Although most current reviews restrict their discussion to one specialty, this volume covers all fields, including roentgenology and psychiatry. All the authors except Middleton are from Great Britain. The newer trends in each field of medicine are

adequately reviewed. The authors have selected only the most pertinent material. The citrovorum is included in the discussion of megaloblastic anemias. The volume has a number of excellent tables and illustrations. There are about 50 color plates. This book is strongly recommended for general practitioners and service personnel in smaller institutions.

—*Col. F. W. Pruitt, MC, USA*

Advances in Internal Medicine, edited by *William Dock*, M. D., Long Island College of Medicine, Brooklyn, and *I. Snapper*, M. D., The Mount Sinai Hospital, New York, N. Y. Volume V. 464 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1952.

This volume contains an up-to-date review and appraisal of 9 subjects by recognized authorities. The presentations are concise, well organized, easily read, and adequate. The subjects and authors are as follows: (1) "Diseases of the Pregnant Woman Affecting the Offspring" by Bass, (2) "Catheterization of the Heart" by Bing, (3) "Portal Hypertension and Its Treatment" by Blakemore, (4) "The Anemia of Infection" by Cartwright and Wintrobe, (5) "Gout" by Gutman and Yü, (6) "Clinical Aspects of Ganglionic and Adrenergic Blocking Agents" by Lyons and Love, (7) "Aspects of the Influenza Problem" by Mulden, (8) "Experience With Adrenocorticotropic Hormone (ACTH) and Cortisone" by Ragan, and (9) "Abnormal Proteins in Myeloma" by Strom.

Bing's discussion on cardiac catheterization is especially noteworthy. It covers the technic, interpretation, indications, limitations, hazards, and complications of the procedure. In addition, clear diagrammatic interpretations of catheterization findings in various cardiac abnormalities are included. Gutman and Yü describe the present concepts of the derangement of purine metabolism in gout and modern approaches to therapy. Although containing nothing new, this is a good review. Ragan's experiences with ACTH and cortisone will be most helpful in orienting the clinician as to the place of these agents in modern therapy. Of particular importance are the limitations and complications of this type of therapy. Lyons and Love remove a great deal of confusion from the present controversial subject of ganglionic and adrenergic blocking agents. This discussion should be read by all who use these drugs.

—*Commander J. B. MacGregor, MC, USN*

MANAGEMENT OF ACUTE HEAD INJURY[1]

JULIAN A. JARMAN, *Colonel, USAF (MC)* [2]

THE correct management of acute head injury has been one of the most difficult problems facing physicians since ancient times. In Hippocratic writings [3], head injuries are described in detail and the use of the trepan was limited as it is today. Doctors would gladly turn over patients with this injury to a specialist but because there are not enough neurosurgeons to take care of all such patients, all physicians should be able to administer proper emergency care and recognize complications when they arise.

Clinical research in recent years has greatly contributed to our knowledge of the pathophysiology of this condition, and this understanding has placed an even greater responsibility on the average physician. Many believed that disruption of the normal continuity of the skull was of paramount importance, but we now know this is not true and that irreparable damage can take place without a single break in the bony framework of the skull. Denny-Brown and Russell [4] have shown that brain damage may result from "oompression concussion" and "acceleration concussion." Compression concussion occurs when the skull is subjected to trauma and is momentarily deformed and distorted though not fractured. This distortion impinges on the brain, producing increased pressure in some areas and decreased pressure in others. The rebounding return of the skull to its former shape produces abrupt changes in intracerebral pressure with damage to the leptomeningeal vessels. Acceleration concussion, on the other hand, results from the momentum of the brain within the skull as the head is thrown through space and then abruptly brought to rest.

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(1) Presented at a meeting of the Las Vegas County Medical Society, 20 May 1952, at U. S. Air Force Hospital, Nellis Air Force Base, Nev.

(2) 5005th U. S. Air Force Medical Group.

(3) Adams, F.: Injuries of the Head. The Genuine Works of Hippocrates. Vol. 1. C. & J. Adelaide, London, 1849. pp. 421-466.

(4) Denny-Brown, D., and Russell, W. R.: Experimental cerebral concussion. Brain 64: 93-164, Sept. 1941; Abstr. Proc. Roy. Soc. Med. 34: 691-692, Sept. 1941.

Pudenz and Shelden *(5)* have shown in ingenious experiments on monkeys with lucite skulls that blows to the head produce rotating, swirling movements of the convolutions of the brain. These convolutional patterns vary with the direction of the displacement of the head. Their experiments indicate that the frontal lobes of the brain are relatively fixed by the anterior fossa and less movement occurs there than in the parietal and occipital lobes. A similar situation exists in the temporal lobes which are fixed in the middle fossa of the skull. This fixation of the frontal and temporal lobe subjects them to greater shearing forces and results in local laceration of cerebral tissue and blood vessels. These observations explain the contrecoup injuries more logically than previous theories, and the experiments are especially convincing because they are documented by high-speed cinematography through a lucite calvarium.

Cerebral edema was considered for many years to be a frequent direct cause of death and attempts were made to prevent and control this condition by limiting fluid intake and administering various hypertonic solutions intravenously. Extracellular accumulations of fluid occur, but usually as a late manifestation in cerebral swelling that is preceded by intracellular hydration, hemostasis, anoxemia, and endothelial damage. Scheinker *(6)* emphasized the term "cerebral swelling," instead of "cerebral edema," believing that the swelling was due to vasoparalysis as Friedman first suggested. Forbes and Wolff *(7)* demonstrated that there is a definite cerebral vasomotor control center. The increased volume of the brain is important because it may cause herniation of the uncus of the temporal lobes through the tentorium, resulting in pressure on the hypothalamus. Kahn *(8)* has shown experimentally the disparity between intraventricular and cisternal pressure in waterlogged animals; intraventricular pressure was always elevated but cisternal pressure seldom; and that decreasing intraventricular pressure improved respiration and circulation, but lowering cisternal pressure further embarrassed these vital functions. This observation is important in view of the fact that many physicians have treated brain injuries by repeated spinal puncture.

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(5) Pudenz, R. H., and Shelden, C. H.: Lucite calvarium—a method for direct observation of brain; cranial trauma and brain movement. J. Neurosurg. 3: 487-505, Nov. 1946.

(6) Scheinker, I. M.: Neurosurgical Pathology. Charles C Thomas, Publisher, Springfield, Ill., 1948.

(7) Forbes, H. S., and Wolff, H. G.: Cerebral circulation; vasomotor control of cerebral vessels. Arch. Neurol. & Psychiat. 19: 1057-1086, June 1928.

(8) Kahn, A. J.: Effects of variations in intracranial pressure. Arch. Neurol. & Psychiat. 51: 508-527, June 1944: correction 52: 71, July 1944.

DeGutierrez-Mahoney and Robinson *(9)* recently reported work done 10 years ago to increase the understanding of the pathogenesis of traumatic unconsciousness. By studying gross sections of untraumatized portions of brains of 4 persons who died from 12 to 48 hours after injury and those of dogs, they found that a physical change takes place in brains that have been traumatized even slightly though no gross lesion is present. These changes included a disturbance of the cell body, the axis cylinder, and the myelin, as well as demyelination with associated perivascular deposits of fat. Unconsciousness resulting from head injury could be attributed to diffuse physical and functional loss of a certain percent of the total nervous elements, and this is the fundamental pathologic explanation of unconsciousness.

PRINCIPLES OF TREATMENT

Although it is illogical to believe that an adequate set of rules can be developed which will permit a physician to care for all severe head injuries easily and properly, an acceptable system of care will reduce this task.

Bed rest. The patient should be brought directly to the treatment ward and put to bed, preferably on his side in mild Trendelenburg position under the constant observation of properly instructed attendants. Inflexible routine treatment of patients suffering from severe head injury is not only useless but dangerous. No other surgical patients require such individual consideration. Alert, watchful care is perhaps the most important feature. Because the patient's condition may vary from hour to hour, continuous, efficient, and intelligent nursing care is necessary.

X-ray. The importance of a roentgenogram of the skull in the early hours of treatment is questionable but I believe that it should be mentioned as it is one of the things frequently considered when the patient is first seen. Its greatest value probably lies in the demonstration of a depressed fracture, or of a fracture line across the course of the middle meningeal artery. These conditions can usually be diagnosed clinically. If the patient's condition permits, roentgenograms should be made early. They are of secondary importance and should be omitted if the extra manipulation might have a deleterious effect on the patient.

Tracheotomy. It is essential to maintain an adequate airway in these patients. Many patients with head injuries probably

(9) DeGutierrez-Mahoney, C. G., and Robinson, F.: Acute craniocerebral injuries; clinical and experimental study of results of more effective form of treatment. S. Clin. North America 471-489, Apr. 1952.

die from obstruction of the air passages due either to inability of air to get into the lungs or to retained secretions. Anoxemia is one of the primary causes of waterlogged brains. Recently, a patient with a severe head injury was brought into our emergency room. A tracheotomy was performed without anesthesia, and it was astounding to see the immediate change in his condition. He lived 3 days after tracheotomy but without it would have died much sooner.

Tracheotomy was rarely performed for this condition a few years ago, but I believe it is now practiced fairly consistently. Patients with head injury develop excessive pulmonary secretions which can be evacuated readily through a tracheotomy tube. Once an adequate airway has been established, oxygen should be administered to every unconscious patient. The secretions may be so tenacious that the force of gravity and catheter suction are insufficient to remove them. We are very fortunate in having a piece of equipment, mist-O_2-gen, by which a desired concentration of oxygen, more than 60 percent, if indicated, with a high degree of humidity is delivered to the patient in an open-top tent; both oxygen and an agent to liquefy secretions in the bronchial tree are thereby furnished concurrently *(10)*. Antibiotics can be delivered to the lower respiratory tract in the aerosol from this device. For general use, a tent is considered preferable, but a nasal catheter is adequate. No matter which is used, proper humidity should be emphasized because dry oxygen will increase the tenacity of the mucous secretions and lead to fatal atelectasis.

Shock. Symptoms of traumatic shock are infrequently observed in patients with uncomplicated head injuries. If the patient is in shock, one should be careful in seeking other injuries such as a broken neck, a fractured femur, or a ruptured viscus. Hemorrhagic shock may occur from extensive lacerations of the scalp which have not received early treatment. We routinely introduce a retention catheter early in treatment. On evacuation of the urine, evidence of injury to the genitourinary tract may be apparent. Visual evidence of kidney function is a valuable aid in the treatment of shock. Continuous catheterization assists in maintaining water balance and frequently obviates a change in bedclothes.

Adequate history and physical examination are more important in institutional care where one doctor might admit a patient in the evening and another take care of him the next day. The history

(10) Denton, R.; Keller, E. A.; Hoffman, A. A.; and Jarman, J. A.: Treatment of pulmonary complications secondary to upper respiratory infections. U. S. Armed Forces M. J. 4: 643-652, May 1953.

might not be available from the patient himself, but probably could be obtained from whoever picked him up or witnessed the accident. The state of consciousness and the observation of a lucid interval are diagnostically important as they are usually present in patients with expanding lesions. A history of vomiting is important because many of these patients, if they vomit and are unattended, may aspirate this material and develop pulmonary complications. A record of spinal fluid leakage is important in planning adequate antibiotic therapy.

A complete physical and neurologic examination should be made as soon after admission as possible as it provides a base line by which to evaluate deviations. An appraisal of the conscious level is important in prognosis and treatment. Frequent checks should be made of the conscious level because it is probably the most accurate index of progress. Blood pressure, pulse, and respiratory rates should be observed and recorded early. The size, reaction, and quality of the pupils should be recorded in all patients suffering from acute head trauma; pupillary function is second in importance only to the state of consciousness. Segerberg and Spurling *(11)* stated that it should be assumed that every patient with a unilateral dilated fixed pupil has an extradural clot until proved otherwise. Operation in such circumstances is lifesaving, and procrastination may mean death. Ophthalmoscopic examination may reveal progressive choking of the optic disk, indicative of increased intracranial pressure. A choked disk may require several days to develop, but venous engorgement, retinal hemorrhage, blurring of the disk margins, and obliteration of the normal landmarks of the disk are valuable signs in determining the degree of intracranial tension.

Localizing signs, such as motor power of the extremities, may be judged in one of several ways. If the patient is confused and restless, one may observe directly the manner in which the extremities are used. If he is semicomatous, deep supra-orbital pressure will elicit a defense reaction of one or both arms so that their strength may be judged. Additional information can be gained by observing the tonicity of the muscles to passive flexion and extension. Frequently a bilateral or unilateral Babinski's sign follows severe head trauma but, unless paralysis is present, this pathologic reflex usually disappears as cerebral function improves.

Lumbar puncture in patients with acute head injury has been greatly overemphasized. Swelling of the cerebral hemispheres

(11) Segerberg, L. H., and Spurling, R. G.: Symposium on recent advances in surgery; acute craniocerebral trauma. S. Clin. North America 29: 1301-1315, Oct. 1949.

due to venostasis and cellular edema produces ideal physical conditions for herniation of the temporal uncus into the incisura of the tentorium. Sudden release of the infratentorial pressure by lumbar puncture aggravates the unnatural pressure relationship and must be considered a potential hazard in precipitating or aggravating tentorial herniations. In the restless patient, pressure readings are inaccurate and the presence of blood in the spinal fluid is of insufficient diagnostic importance. Information that may be obtained from a lumbar puncture can be derived, in most instances, from other clinical findings.

Restlessness is often more disturbing to attendants than to the patient, and may be more overtreated than any other symptom. It is frequently due to anoxemia which may be controlled, in many instances, by proper oxygenation. Restraints should never be used. Some restlessness is beneficial as it permits changes in motor function of the extremities to be observed. Morphine should not be used because it depresses respiration and masks ocular signs. If sedation is necessary, small doses of paraldehyde are recommended.

The hypothalamic centers are particularly susceptible to trauma and the heat-regulating mechanism is frequently upset. When the rectal temperature reaches 104° F. every effort should be made to reduce it. Sometimes simple measures such as cold water or alcohol sponge baths will suffice, but frequently it will require cold packs with an electric fan blowing on the packs.

Fluid balance. An accurate intake-and-output record of fluids must be maintained, and any blood lost should be replaced without delay. The maintenance of a normal fluid intake is essential, and the dehydration treatment popular a decade ago has been abandoned. The concept that dehydration might prevent cerebral edema is erroneous because this condition probably does not depend on the normal fluid requirements of the body. Dehydrating agents are seldom recommended as there is no clinical evidence of their value. The average adult should receive from 2,500 to 3,000 cc. of fluid in 24 hours to maintain a normal state of hydration, and we furnish this as 5 percent dextrose solution. In the second 24-hour period, fluids equal to the insensible loss plus the urinary output should be given but with no more than 500 cc. of saline solution. Thereafter, fluids, calories, and vitamin requirements can best be administered by gavage. We maintained a patient on this regimen for 57 days. Even though he never attained normal mentality, he recovered sufficiently to take care of himself. We use a gavage solution of about 1,000 calories per 1,000 cc. that is high in proteins, carbohydrates, and vitamins.

Other measures of importance are protection of the eyes, care of the mouth, antibiotic therapy, and the prevention of hypostatic pneumonia. Fecal impaction should be prevented.

Except for the care of certain obvious conditions such as lacerations of the scalp, compound fractures of the skull, and depressed fractures of the skull, most patients with severe head injuries recover without surgical operation. Although in 700 consecutive patients with head injuries, DeGutierrez-Mahoney and Robinson *(9)* reported surgical intervention in only 58 (8 percent), this represented 50.4 percent of those classified as "severe" head injuries. Elective operations should be performed as soon as the patient's condition permits. Compound fractures and depressed fractures fall in the "urgent" category, but the patient should not be hurried to the operating room at the expense of proper preparation. Débridement should be accomplished in compound fractures, from without in, and should be thorough. The dura should be closed, if possible, or the gap should be bridged with fascia lata to prevent scarring. Replacement of bone fragments is not advocated The fascia and skin may be closed initially and the defect later bridged over with bone or tantalum.

Depressed fractures are usually associated with localized cerebral laceration and contusion and, if uncorrected, may be a cause of traumatic epilepsy. Extradural and subdural hemorrhage produce the same signs and symptoms, except that the former usually occur faster.

Segerberg and Spurling believed that, of all serious complications of head trauma, extradural hemorrhage is the easiest to recognize and the most satisfactory to treat; yet it is reported that in most large clinics the mortality from this lesion varies from 30 to 50 percent. This may be due to failure in diagnosis, delay in operation once the lesion is suspected, or severe associated injuries. The findings are usually classical. The patient is dazed or unconscious for a few minutes after a blow on the head. He may recover completely or may complain of headache, perhaps nausea, or a feeling of faintness. He usually becomes rational after the injury (lucid interval). Within an hour or so he becomes dull and feels drowsy; sleep steadily progresses to coma with stertorous breathing; the pulse becomes slow; and the blood pressure is elevated. There are usually signs of external violence over the head in the temporal region—the pupil on the injured side may be larger than on the normal side, or may even be widely dilated and fixed. There may be contralateral weakness of the arm and leg with a positive Babinski's sign on the weak side. If there are roentgenograms of the skull,

a fracture line may be seen across the course of the middle meningeal groove. Although some patients may not regain consciousness, in others the lucid interval may last several days. Early diagnosis cannot be expected until all physicians—even those who care for patients with head trauma only occasionally—know these early signs and symptoms. Because it is impractical to hospitalize every patient in civil life and because it is even impossible in many instances to have a private nurse or professional attendant constantly with the patient, an intelligent member of the family should be selected to stay with him and be thoroughly instructed as to what to look for. Segerberg and Spurling go so far as to say that no patient who has been unconscious from a head injury should be allowed to sleep longer than 2 hours during the first night without being aroused.

Subdural hematomas may be acute or chronic. Intracerebral hematoma may be discussed at the same time as acute subdural hematoma because, pathologically, they may arise in the same way. The patient with an acute subdural hematoma usually comes to the hospital still in coma. When contrecoup injuries occur, they are usually of this nature. When intracerebral bleeding occurs, the hemorrhage may consist of large amounts of laked or clotted blood. It may be impossible to differentiate between extradural, acute subdural, and intracerebral bleeding. This differentiation is of academic interest only. All 3 lesions demand prompt surgical exploration.

Chronic subdural hematoma has an insidious onset. The injury may be slight, without rupture of brain tissue. Shearing of a small vein bridging the cerebral cortex and sagittal sinus is sufficient. A small amount of bleeding that becomes walled-off is augmented by the dialysis of cerebrospinal fluid into the area through the semipermeable arachnoid membrane so that the protein content in the hematoma is greater than that in the cerebrospinal fluid. The expanding subdural hematoma is progressively encapsulated by a membrane of mesothelial cells. The symptoms may not be distinguishable from those of a brain tumor because the injury may have been slight and overlooked. The major complaints are increased headaches and mental dullness progressing to somnolence. Convulsions or hemiparesis may develop. There is usually papilledema, slowing of the pulse rate, and gradual increase in systolic blood pressure. Spinal fluid may be xanthochromic. When subdural hematoma is suspected, bilateral burr holes should be placed in the superior temporal, frontal, and parietal regions. A blue discoloration of the dura is a characteristic finding. Frequently the lesion can be cured by simple evacuation of the hematoma with thorough lavage of the interior of the limiting membrane. Occasionally it will be filled with solid clots and a more extensive unroofing may be necessary for this evacuation.

Subdural hygroma closely simulates subdural hematoma. It is caused by a tear in the piarachnoid which acts as a ball valve, allowing cerebrospinal fluid to escape but not permitting it to return. Symptoms and treatment are similar to those described for subdural hematoma.

Persistent *cerebrospinal rhinorrhea* sometimes requires surgical operation. It is caused by dural laceration accompanying a fracture through the anterior fossa into the cribriform plates, and is usually unilateral. This condition usually clears spontaneously, but if it persists, consideration should be given to operation by a neurosurgeon.

Tentorial herniation with the development of decerebrate rigidity arises as the result of a massive cerebral lesion producing herniation of the brain stem. This condition may occur whenever the intracranial tension above the tentorium is greater than below, particularly when the increase of pressure is rapid. Extradural hematoma, subdural hematoma, intracerebral hemorrhage, and cerebral edema are frequently complicated by tentorial herniation. Whatever its cause may be, it is a serious complication, for which effective treatment has not been fully established. Many methods of treatment have been described, but one developed by Boctterell and reported by Segerberg and Spurling appears the most logical. This method consists of removing the pulpified brain in the temporal or frontal area with suction, producing an internal decompression. They believed that removal of this useless pulpified brain tissue discourages cerebral swelling. The surgical approach is on the inferior and medial surface of the temporal lobe, which reduces the danger of sacrificing centers of vital cortical function. This is a logical approach for it permits the removal of damaged brain tissue and intracerebral clots and assures control of the bleeding vessels in the area. As the temporal lobe is most frequently involved, the approach is first directed towards this area. This is major brain surgery.

BOOK REVIEW

The Human Senses, by *Frank A. Geldard,* Professor of Psychology, University of Virginia. 365 pages; illustrated. John Wiley & Sons, Inc., New York, N. Y., publishers, 1953. Price $5.

In many ways this is a remarkable book. In the preface the author makes a somewhat apologetic gesture to the possible prejudices of his professional colleagues for introducing a book on the human senses in this day of emphasis on the "science of

behavior." Fortunately, thereafter he writes without apology and with complete fidelity to the fundamental role of the senses in regulating behavior and supplying our knowledge of the world about us. The many who will read this book will be convinced no apology is required. On the contrary, they will be grateful for one of the most useful and readable books on the senses which has been written. The author's grasp of his subject permits him to move about among complex data and theories of the senses with ease and clear insight and to give the reader a clear comprehension of a subject which too often in the past has been buried in a mass of handbook data.

A short introductory chapter places the study of the senses in its historical framework and relates the importance of the understanding of the senses to the new field of human engineering. Geldard's wartime experience as chief of the Psychological Section of the Army Air Force Training Command and his present position as chairman of the Human Resources Committee of the Research and Development Board, Office of the Secretary of Defense, gives him an excellent background from which to survey the relationship of the senses to human engineering. For each sense described in the book there is a systematic description of the known facts and theories. Each sense is explored systematically in relation to stimuli and anatomic, physiologic, and psychologic functions and theory. The accompanying charts, diagrams, and illustrations enhance the value of the text. The author maintains an admirable scientific caution which in no way limits his subject matter but, on the contrary, permits him to evaluate critically and to suggest areas where further knowledge and research are essential to a complete understanding of the subject. Vision, audition, the cutaneous senses, pressure, pain, temperature, kinesthetic and organic sensibilities, labyrinthine sensibility, smell, and taste are described. An extensive list of references and an index are included. The phenomenologic and psychologic characteristics of sensitivity are integrated into the body of knowledge of each sense by a careful selection of experimentally demonstrated facts. To be able to cover such an extensive area as the senses in 365 pages, avoiding either paucity of details or incompleteness of exposition, is an accomplishment I wish were more generally extended to writing in other fields.

The book may be read with understanding by anyone interested in the senses who has a basic familiarity with physiology, psychology, or experimental methodology. Used either as a textbook or as supplementary reading, and probably also as the basis for the instructor's lectures, it will be a boon to instructors in psychology and physiology. It is recommended to all who wish a readable, accurate, and up-to-date account of the status of our knowledge of the senses.—*Col. J. Buel, USAF (MSC)*

PREVENTIVE PSYCHIATRY IN THE COMBAT ZONE[1]

ALBERT J. GLASS, *Colonel, MC, USA* [2]

TO conserve the fighting strength is the traditional obligation of the Army Medical Service. Although in past wars and in the Korean conflict, Army medical personnel have made great strides toward this objective, progress in the preventive aspects of field medicine has been limited, to a great extent, to the purely organic sphere of disease and injury. Relatively little consideration has been given to the fact that human effectiveness in combat is largely determined by an interaction of both somatic and psychic forces. Such a psychosomatic approach to the problem of individual combat efficiency is especially needed as the increasing destructiveness of modern war imposes ever greater physical and mental hardships on its participants. It is the object of this report to describe the mechanisms involved in the total reaction of soldiers during combat in an effort to indicate additional ways of implementing more completely the mission of the Army Medical Service.

MANIFESTATIONS OF FAILURE

The following manifestations of failure in combat delineate the magnitude and scope of the problem. *First,* there are the numerous nonbattle casualties. Their frequency exceeds the battle casualty rate in increasing proportions the longer a unit remains engaged with the enemy. Over 50 percent of nonbattle casualties involve persons with: (1) slight organic disease or injury that is only mildly, if at all, incapacitating; (2) subjective complaints and negative or inconsequential physical findings; (3) self-inflicted wounds and injuries that are due to carelessness; (4) broken or lost spectacles and dentures; and (5) psychiatric conditions. Although many of these patients can be returned to duty by prompt medical management and treatment, their services are lost for a long or short time; and, in many persons, the original cause for evacuation will continue to operate after they are returned to duty.

Second, there are the combat failures as manifested by disciplinary offenders. Of special importance in this group are the

(1) Presented at the Symposium on Stress, 17 March 1953, at the Walter Reed Army Medical Center, Washington, D. C.

(2) Brooke Army Hospital, Fort Sam Houston, Tex.

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purely military crimes directly connected with the battle situation such as insubordination, disobedience of a direct order, misbehavior before the enemy, desertion, and AWOL. In these offenders the overt withdrawal from battle is plainly a psychologic failure of adjustment which, in World War II, caused a serious loss of manpower.

Third, and perhaps most important from a numerical standpoint, there are the men who remain in combat but contribute little or no fire power. This phenomenon has been noted by many observers of front-line fighting, and has been thoroughly studied by Marshall (3) who stated that only from 15 to 25 percent of rifle company personnel actually fire on the enemy and exhibit aggressive activity on appropriate occasions. Although this may be a low estimate for fire-power participation in the Korean campaign, no one can deny that the large number of such passive combat personnel constitutes a serious problem.

Common to all of these manifestations of combat failure is an apparent inability of the soldier to assume or to continue an aggressive role against the enemy. This defect does not come as a direct result of enemy action, such as an incapacitating wound, nor does it arise from unavoidable battlefield conditions that may produce a disabling injury, such as frostbite; or a disease, such as infectious hepatitis. Rather, it stems from forces within the man that seemingly bind or restrict the function for which he has been trained and equipped. The ubiquitous phenomenon of *battle fear* is responsible for producing this inhibition of aggressive action. The crippling sensations of battle fear are well known and are experienced by almost all combat soldiers. Indeed, it has always been considered good military strategy to weaken enemy resistance by intensifying or otherwise using the sounds and other stimuli which provoke fear. In brief, the paralyzing property of battle-induced fear is the common denominator in the cause of all forms of combat failure.

Time does not permit an adequate discussion of the origin and mechanism of fear, which is a basic biologic factor that warns a person of impending danger. The greater the extent to which a man believes that his existence or the values held essential for existence are threatened, the more intense is the crippling feeling of fear. In battle, fear varies in direct proportion to the real or imagined danger from the enemy. It is usually judged by the intensity of enemy fire power, particularly when the effect of that fire power is confirmed by the presence of nearby casualties. Thus, the incidence of psychiatric casualties, the most direct manifestations of combat fear, regularly rises and falls with the battle casualty rate. The influence of fear is more indirect in

(3) Marshall, S. L. A.: Men Against Fire. William Morrow & Co., New York, N. Y., 1947.

noncombat casualties, yet their frequency also increases with the length of time a unit remains in battle. The most striking effect of fear, as reported by Colonel Marshall, is the failure of riflemen to fire their weapons in battle, although no such inhibition is present on maneuvers or on other occasions when battle fear is absent.

In its effect on combat personnel, fear can be compared to the action of a virus or other infectious agent. If the dose is sufficiently large, almost anyone may be overwhelmed. Similarly, when smaller doses of fear are administered steadily over a prolonged period of combat, even the superior soldier will slowly but surely become ineffective. Like infectious agents, fear may be contagious, but it spreads far more rapidly than they because there is little or no incubation period. Unlike infectious organisms, however, fear does not confer an immunity on its victims. Men may learn to adapt better under fearful conditions, but there is no diminution of the painful and paralyzing action of fear as a result of repeated exposure. This fact is responsible for the recognition of rotation as the only method of preventing the inevitable breakdown of veteran combat personnel.

Despite the devastating effect of battle fear, many combat participants not only function effectively, but often perform feats of bravery involving extraordinary aggressive behavior. Moreover, the influence of fear in battle is uneven. Its effect varies even in the same man. The personnel of some units may consistently perform more effectively in battle than that of other units despite similar stressful conditions. It is clear that there are successful defenses against fear. Although our understanding of these protective mechanisms is far from complete, we have some knowledge of the complex process that is involved.

ANTIDOTES FOR FEAR

Activity. At the outset, it can be stated that there is an antidote to the poison of fear, namely, co-ordinated external activity. In combat, even speech is beneficial, but aggressive action, as in firing and purposeful movement, produces marked relief from the sickening feelings of fear and allows the soldier to think logically again and to make rational decisions. The reasons for this alleviation of fear illustrate well the psychosomatic basis for human behavior. Fear produces both a psychologic and physiologic effect on a person in order to prepare him for fight or flight. The same tension that grips and paralyzes the mind also presses the bodily mechanisms for action. Action, therefore, drains tension, whereas inaction fosters the damming back and building up of tension. This state of affairs is exemplified by the many occasions in combat when external activity is impractical or impossible. The increased painful tension produced by such an

immobilized state under fire and its accompanying bodily effects are well known to combat personnel whose body language, "sweating it out," is an apt description of their experience.

Therefore, any successful defense against combat fear depends on either aggressive action when possible or an increased capacity to tolerate tension, or combinations of both. This simplified explanation, however, fails to indicate the interaction of somatic and psychic forces that make it possible for the soldier to adopt and to maintain such successful defenses. In other words, resistance against fear can be translated in terms of a psychosomatic process, the further understanding of which may provide useful tools for preventive efforts.

A basic component of the psychosomatic defense against fear is the role played by personality structure. Men vary in their innate ability to control fear. Several character traits, the most important of which is passivity, are pertinent in this respect. A marked degree of passivity produces dependence on others, avoidance of conflict, and helplessness when confronted by minor stress. It is a product of early conditioning that banned any aggressive behavior by threats of retaliation or withdrawal of affection. Persons with such a background repress all aggressive drives as being dangerous and evil. In combat, they are quite vulnerable to fear because of their relative inability to discharge tension by action. The severely passive person demonstrates in an exaggerated form the problems of almost all combat personnel because they, too, possess some degree of the same character trait. This is not surprising, because our culture demands obedience in the early formative years and deplores physical acts of aggression except under specified conditions such as some of the sports. Later, society enforces this attitude by realistic threats of retaliation and social ostracism. It is difficult to change from the passive habit patterns of peace to the death-dealing aggressive action needed in war, yet, under conditions to be discussed later, such a transition has been shown to be quite possible if the degree of passivity is not too marked.

Conscience. Another personality facet that bears on combat adjustment is the self-critical faculty, commonly referred to as conscience. This is an internalized representation of the rules and standards of society that were first laid down by the parents. It forces a person to conform to duty and to other social obligations by threatening withdrawal of self-esteem. Painful feelings of guilt result if important ethical standards are violated. In combat, conscience may serve as a powerful lever, forcing the soldier to remain in battle and to tolerate fear lest he suffer the pain of self-condemnation. Men with small or permissive consciences have no counterthreat toward using manifestations

of withdrawal from combat. Conscience functions as an internal policeman. It may not force the soldier to fire his weapon, but it does curtail his tendencies to flee the painful battle situation. This self-governing faculty can be used as a basis for further influencing the soldier toward aggressive action as being the only correct behavior in battle that will be rewarded by a feeling of self-esteem.

Self-love. A third personality trait pertinent to combat adjustment is the universal characteristic of self-love, termed narcissism by psychiatrists. It is, perhaps, better understood as the self or egocentric component of the person. Varying degrees of this trait determine the extent to which a man can love or be concerned for persons other than himself. Usual quantities of self-love do not prevent devotion to family and friends, and lesser feelings for more remote society groups such as the state and nation, but it is rare to find persons comparable to the historic Nathan Hale who regretted that he only had one life to give for his country. In combat, men dominated solely by self-love are much more affected by fear, because their entire interest is in the self, whereas the average soldier is able to transform some quantity of fear into concern for the safety and welfare of his buddies.

It is hoped that the foregoing discussion of personality traits does not give the impression that they play only a fixed role in combat adjustment. Such an impression would warrant the conclusion that only by the selection and removal of vulnerable personnel could combat failure be prevented. Nothing is further from a practical solution of the problem. *First,* there are no available methods that can correctly estimate the degree and strength of the various personality constituents. *Second,* the many imponderables in battle make any estimation of personality structure of doubtful value. Truly the battle is the payoff when men may perform feats of endurance and bravery that neither they nor others could predict. It is only when marked passivity and/or self-love are present in a man that change to a more effective combat adjustment is difficult or impossible.

Physiologic well-being. Attention can now be directed toward the less structured elements of combat adjustment. The physiologic status of persons who struggle against combat fear is very important. Weakness in the physical sphere automatically diminishes ability to perform the necessary actions required for aggression. A man with decreased physical power is temporarily like the severely passive soldier who can only absorb fear, because of inability to be aggressive. It has been repeatedly observed that undue fatigue and deprivation of food, sleep, and water may readily produce ineffective combat performance. For

this reason, combat units must be placed in reserve at periodic intervals for rest and recuperation. Intercurrent illness such as diarrhea, malaria, and hepatitis, aggravated by the usual discomforts of men in battle, produces a breakdown in the defense against fear. In Korea, during the summer and early fall of 1950, patients with Japanese encephalitis were evacuated as having combat exhaustion because their initial symptoms indicated disabling fear. The necessity of maintaining the physical well-being of combat troops is well known, but the fact that smaller or less apparent bodily weakness may uspet the psychic control of fear is not so well recognized. For this reason alone, and exclusive of morale purposes, combat effectiveness can be enhanced by attention to diet or to other measures that maintain physical status.

Training. A realistic training program increases physical stamina and prepares the soldier to endure the hardships of combat, but even more important, training provides the technical information and practice in the use of weapons that make possible aggressive behavior. Instruction in combat tactics facilitates a better awareness of danger and the protective measures that are best employed. Despite these advantages, troops new to battle have an increased number of all types of combat failure. This is especially true of replacements that are suddenly ordered into active combat. In part, at least, this defect of new troops lies in (1) their inability to acquire rapidly the aggressive patterns of behavior and (2) their overevaluation of battle stimuli because of inexperience. As a preventive measure, a battle indoctrination period of from 7 to 14 days has been instituted for all infantry divisions in Korea. Any method that allows the replacement to become acquainted with the members of his combat group, enlarge his knowledge of enemy tactics, and become familiar with his weapons, will surely diminish the first impact of battle and aid in building defenses against fear.

Group identification. The most important component in the psychosomatic defense against battle fear is the powerful support that can be obtained from the group or combat unit. This sustaining force, called group identification or group unity, refers to the emotional bond that develops among men who share common hardships and danger. It has been repeatedly demonstrated that positive group unity is the distinguishing characteristic of successful combat units who endure severe battle losses with a minimum of individual combat failures. The intricate process by which such successful groups operate is as yet not completely understood.

Seemingly, group identification spontaneously arises as a defensive measure by two or more persons in response to a com-

mon menace. Nowhere is there a greater need for such an alliance as in battle, for, as well stated by Marshall, "The battlefield is the lonesomest place where men may share together." In this situation, men move toward each other both figuratively and literally for protection and emotional warmth. When group unity proves by battle test to have value, strong friendships are rapidly formed and intensified by the mutual exchange of affection and protection.

This intense emotional relationship, forged in the crucible of combat, exerts a profound influence on character and behavior. *First,* there tends to be displacement of quantities of self-love by concern for the welfare of other members of the group. Less fear is then felt for the self, and the consequent decrease of inhibition facilitates aggressive behavior that can be used in behalf of others. Such a mechanism accounts for heroic deeds in battle by men who seem heedless of personal danger because they are intent only on securing the safety of their friends. *Second,* this attitude toward others is re-enforced by a strengthening of conscience that includes the ideals and standards as set forth by the combat group. A man who is compelled to abandon selfish desires, "or else," not only suffers self-condemnation but risks losing the actual and emotional support of the group. Even the poorly motivated soldier is literally forced to adopt the prevailing group attitude because the battle situation is hardly a place to be left alone. *Third,* there is the effect of the group on the character trait of passivity. As the passive soldier comes to feel more secure by identification with a strong group, he adopts their aggressive attitude. It is sometimes amusing to note the recent replacement to a veteran unit who not only talks and acts like the others, but assumes the entire history of their vicissitudes and grievances. Even the severely passive person can become effective if bolstered by a strong buddy.

The result of favorable group identification for the soldier is lessened vulnerability to battle fear and an increased tendency to aggressive behavior. Its benefits are strikingly revealed when group unity is suddenly disrupted or destroyed in battle. The survivors, stripped of their support and figuratively alone, are suffused with fear; and many become temporarily ineffective.

Leadership. Unfortunately, not all units form favorable identifications or derive the benefits that have been described. Some groups, for various reasons, do not develop unity of spirit. Their combat efficiency, if any, is solely due to the work of a few aggressive men. Such groups are merely a collection of soldiers in a military unit. Other units may have cohesiveness and other characteristics of group identification, but are poorly motivated for the combat mission. With this defect in group attitude, members

may support each other in condoning manifestations of combat failure. Newcomers find themselves impelled to adopt the negative standards of the unit.

Because positive group identification plays such a basic role in the formation of defenses that prevent combat failure, any factor or condition that furthers this goal is of major importance. For this reason, leadership has been recognized as a vital force in the success of combat units since the recorded history of warfare. For purposes of this report, only leaders of company grade officer ranks are considered because they live in intimate contact with their men and are in a key position both to initiate group unity and to mold its attitude. Leadership in battle is a necessary phenomenon because the hazardous situation produces a strong demand for guidance and help. The leader who fulfills this need becomes beloved like the good parent and can exert extraordinary influence on the attitudes and the behavior of his men. On the other hand, inability to perform adequately in combat and to protect the group, as well as callous or unfair management, will almost certainly induce a negative group attitude. The combat leader also symbolizes authoritarian military pressure. If he is well regarded, the combat mission is viewed as necessary. Although there are many writings on the attributes and qualities of leadership, it is easier to detect errors in leadership than to point out positive qualities except in general terms, because persons of widely varying temperament and using a variety of methods may be efficient combat leaders.

In the further consideration of factors that affect group unity, there has been a growing recognition of the importance of communication in group identification. Talk literally links men together. It not only prevents loneliness, but the information transmitted facilitates aggressive behavior. Without knowledge as to the whereabouts of others and the specific purpose and nature of the battle mission, the combat soldier has no realistic method of determining when and where to be aggressive. The result is inaction with its consequent damming up of tension that results in decreased efficiency when directly called on to move and fire. Even the method of communicating becomes important, because the choice of words and the manner in which they are spoken may convey different meanings or degrees of urgency. Here is another area in which the combat leader must exert considerable attention, although all group members must be taught to participate in order that information can be adequately disseminated.

Another factor that contributes to group motivation is the management of rewards and punishments. Because the combat group is deprived of gratification both in material comforts and

of their usual objects of affection, further deprivations, considered unwarranted by the group, are met with marked resentment, which, if they are continued, may change or prevent positive motivation. No matter is too small in this respect. For example, during one period of the Italian campaign in World War II, cigarettes sent to the combat troops were not of the so-called "name" brands. Vigorous resentment arose because it was believed that the name brands were being distributed to rear troops. Similar difficulties may arise in the distribution of food, clothing, beer, and mail, but deprivations and hardships known to be unavoidable are well tolerated. The foregoing discussion does not refer to so-called "griping," because all too often matters of this kind may be summarily placed in that category and are even believed to be a sign of mental health. The combat soldier is well aware of the difference between his griping and the occasions when his legitimate needs and requests are denied for insufficient reasons. It should be apparent that to deprived persons, ordinary comforts and even what are considered civilian necessities, such as a bath, a can of beer, and a letter from home, are magnified to extraordinary pleasures. A similar emotional attitude pertains to promotions, decorations, recuperative leaves, and the like. The combat leader must avoid any suspicion of unfairness. Punishment in a combat group should be prompt, firm, and in accord with the situation, or the group opinion will be that illegal behavior is not only condoned but rewarded.

CONCLUSIONS

Individual performance in combat is determined by the struggle in which the resistant properties of personality, physical status, training, group unity, and leadership are opposed to the crippling effect of battle fear. This approach to the cause of combat failure points to logical measures of prevention because defects in any of the foregoing sustaining forces render the combat participant vulnerable to the inroads of fear.

Efforts to prevent individual combat failure are well within the province of field medicine and should be the especial concern of battalion, regimental, and division surgeons. In their role as staff members, these officers can enhance their value by providing the technical information needed either to initiate methods of improving the efficiency of troops or to correct errors that are causing combat failures.

A major prerequisite for field medical officers in assuming this additional role in preventive medicine is a reorientation in viewpoint, and in their duties and functions. The medical officer should appreciate that he need not restrict his talents to the relatively narrow realm of treatment and evacuation. He is also

a staff officer with a major responsibility of advising his commander on all matters that will conserve effective manpower, whether it be in the prevention of organic disease, psychologic failure, or combinations of both. In such a function, the medical officer should not believe that he must be equipped with the technical knowledge of a psychiatric specialist. He understands the emotional reactions of combat soldiers far better than most psychiatrists because he is intimately associated with combat personnel and is personally identified with the battle situation. Much of the psychologic data required by the field medical officer is available and more will be forthcoming in the future from research projects that are now underway.

In order to perform their staff functions, battalion and regimental surgeons cannot seclude themselves in their aid stations and play a passive role of waiting for casualties. They should visit the various units, consult with the company officers, and demonstrate interest in all manpower problems. When information gained on these visits is combined with data obtained from patients, the medical officer, particularly the battalion surgeon, is in an excellent position to indicate problems and, perhaps, their cause and prevention as well. Line officers also should be taught all we know about the prevention of nonbattle casualties including the fact that medical staff officers can supply both information and technical advice.

If attention is focused on this aspect of preventive medicine by both medical and line officers, benefits in combat efficiency are as inevitable as the advantages that followed attention to prevention of organic disease. Both situations involve the vital principle of first recognizing that a problem exists, then of developing the methods of prevention which logically follow and which can be developed further.

For the medical officer, work in preventive psychiatry can be especially gratifying. It will broaden his outlook and make him truly a specialist in conserving the fighting strength. He can thereby better keep up with his civilian colleagues who, more and more, are using a psychosomatic approach to the prevention of failure in civil life.

A MUSCLE-CONDITIONING MACHINE[1]

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MUSCULAR conditioning is the process of achieving strength and endurance in skeletal musculature. The benefits of muscular conditioning include an increase in strength, vigor, endurance, and a feeling of general well-being. Following injury or operation, recovery of muscle tone by proper conditioning accelerates return of joint motion, enhances circulation to the extremities, and improves the patient's morale. Muscular conditioning is achieved by exercise against resistance.

This report describes a resistance machine based on the principle of the variable resistance produced by a hydraulic piston and cylinder. Comparative resistances are determined by a gage attached to the fluid-flow control valves of the hydraulic cylinder. The machine consists basically of 2 hydraulic pistons operated by individual bars attached to fulcrums. The addition of a third piston and flexible connections permits movements of abduction and circumduction (figs. 1, 2, and 3). The distal ends of the bars have footplates for the attachment of shoes or boot casts (fig. 4). The hydraulic pistons supply resistance which can be regulated to the capabilities of the patient. The machine was designed for, and is used by, patients who have regained neuromuscular control and can resist the force of gravity. Prior to the recovery of muscular control and of sufficient strength to resist gravity, the patient is given physical therapy, first by simple muscle settings and later in the therapeutic pool. When he can resist gravity he is advanced to resistive exercises using the machine herein described. Most of our patients progress rapidly to the use of the exercise machine and when they have attained a standard level of performance on it they are adjudged ready for return to duty. The pattern of performance on the machine serves as an index of progress and a gage of fitness for duty.

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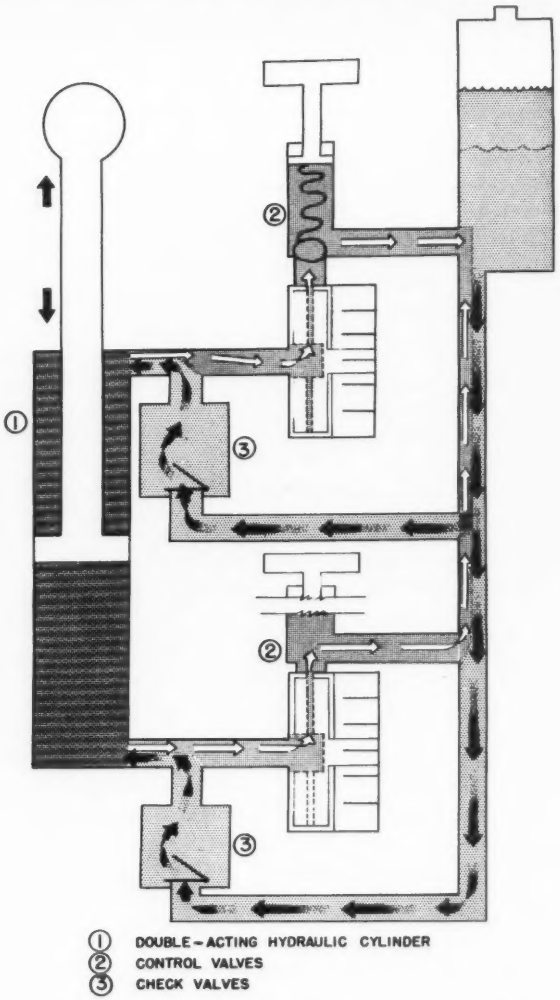

Figure 1. Fluid flow diagram of piston resistance element indicating the method of controlling and reversing the fluid which supplies resistance to the cylinder.

The machine is used with the patient lying supine on a table with his legs extending off the end from the mid-thigh and with his feet attached to the footplates. In operation, synchronous flutter kicking of the legs is produced with the knees in a position of full extension. This involves musculature from the nipple

Figure 2. A piston resistance element showing the dials to control variable resistance for the up-and-down stroke and the action lever attached to the piston. Figure 3. Control panel and interior aspect of machine. Note horizontal resistance element to permit abduction-adduction motion.

line to the toes, including the pelvic stabilizing muscles, abdominal muscles, flexion-extension hip musculature, the intercostals, diaphragm, and the quadriceps femoris. The hydraulic units may be used as resistors for the adductors and abductors of the hips, as well as for the flexor and extensor muscles. Circumduction performed against the multiposition resistance created by the 3 hydraulic pistons co-ordinates the conditioning of the hip and the musculature of the lower extremity. The exercise is performed slowly and gently, but the effort required soon tires the muscles in use. This fatigue is essential for increasing

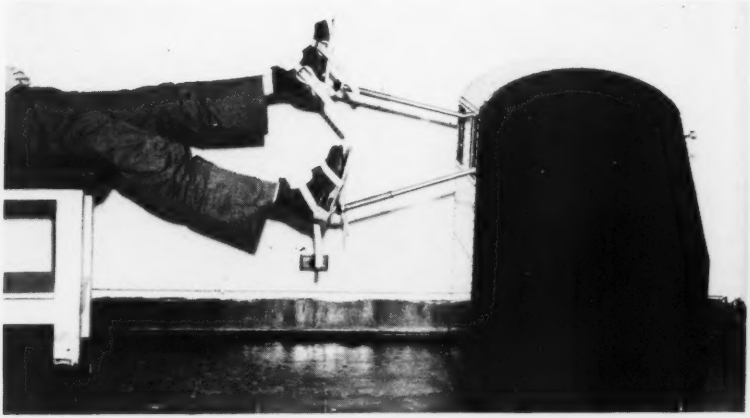

Figure 4. Piston resistance machine in use in exercise of lower extremities. Knees are extended and legs are moved simultaneously up and down but in opposite directions.

muscular strength and endurance. In our experience, it has never passed the point of rhythmic muscular response and reciprocal action, or produced in-co-ordination or poor habit patterns of exercise.

The apparatus is used for muscular conditioning above the nipple line by replacing the footplates on the ends of the lever arms with handles (fig. 5). The patient is placed in a sitting position and grasps the handles to exercise the shoulder joint. The arms are kept horizontal to protect the shoulder musculature. Abduction, adduction, flexion, extension, and circumduction are possible. The hydraulic resistance machine has been used for generalized conditioning of specific groups of muscles. Large segments of the body may be exercised in one maneuver which develops a synchronous neuromuscular pattern and gradually increases the strength of the weak muscular group until the whole unit is fully conditioned.

Conventional conditioning exercises for the lower extremity frequently involve acute flexion of the knee joint and require maximal muscular effort to extend the leg against weights attached to the foot. We are opposed to obtaining maximal muscular response from a position of acute flexion of the knee. Postoperative or posttraumatic exercise of a joint, such as the knee, in a difficult mechanical position such as acute flexion and

Figure 5. Piston resistance machine, showing abduction-adduction of both upper extremities, synchronous opposite motion, and position for protecting the joints.

against weights or weighted cables is regarded by us as extremely hazardous. We believe that the friction and strain imposed on the subnormal joint is undesirable. If a patient is able to perform the physical feats required by such exercises, it is quite likely he is fit for return to duty. We believe that with few exceptions, when muscular strength is recovered, maximal motion of the involved joint will be obtained. We make no attempt to exercise joints, but only to gain maximal muscular strength. If this principle is followed, joint motion will occur sooner and with greater certainty.

Our policy is to exercise the joint in the position of greatest stability, protecting it by both flexor and extensor muscles. Exercises are then directed toward strengthening the stabilizing musculature with the joint in this position. We believe that recovery of joint motion is the result of favorable physiologic processes rather than of short-wave diathermy, roentgen, or other therapy. When muscular strength is regained, maximal motion of the involved joint usually follows though occasionally manipulation may be helpful.

The machine described is not represented as a panacea for motorskeletal disability following injury or operation. Our experience has been that it accomplishes muscular conditioning in about 90 percent of our patients. The time saved in physical therapy was one factor that induced us to design the machine. By means of the valve controls the operator can adjust the resistance of the up-and-down and side strokes of the pistons for individual requirements. The optimal amount of exercise is obtained in 5 minutes or less by resistive exercise. This machine is simple to operate and requires little attention during use. One physical therapist can supervise a number of machines, thus saving time and strength of trained personnel. The machine is nearly foolproof and it is almost impossible for the patient to injure himself with it. The only servicing required during over 1 year of heavy daily use has been the occasional tightening of several joints to stop minor leaks of hydraulic fluid.

The psychologic impetus imparted by the machine is the same as with any given work for which the object is to achieve a high score. The physical score is measured as the number of strokes at any given resistance level. The psychologic stimulus is less than with competitive sports, but when a patient can take part in such games devised for physical exercise he is ordinarily fit for duty.

A machine of this type has an application to military personnel other than patients. Muscular conditioning is a valuable background for learning neuromuscular responses to new circumstances. The machine described will rapidly and efficiently condition the musculature of the patient and increase his ability to learn new skills.

SUMMARY

A machine for muscular conditioning based on the action of variable resistance hydraulic pistons has been designed. It is compact, easily constructed, portable, and free of gadgets. It is simple to use, and has proved effective in achieving muscular strength by active exercise. Little effort or supervision is required by the physical therapist. The machine has been efficacious in conditioning the skeletal musculature by passive exercise with the joints in a protected position. The resistance for each extremity may be individually graded. The principle of driving the musculature to fatigue by massive resistive exercise in a short period of time and thereby gaining strength, endurance, and hypertrophy of skeletal muscles is supported.

SIMULTANEOUS RECORDING

of the Electromagnetic Ballistocardiogram and Electrocardiogram on a Single Channel

MONROE H. GREEN, *M. D.* (*1*)

SINCE the publication by Dock and Taubman (*2*) of simple ballistocardiographic recording technics, it has become possible for all who have access to electrocardiographs to record ballistocardiograms, using electromagnetic, piezoelectric, or photoelectric pickups, connected with an electrocardiograph of any type. Gubner (*3*) pointed out that it is necessary to use multichannel recording devices in order to correlate waves of the ballistocardiogram with known events of the cardiac cycle. This was especially important in patients with abnormal tracings. Simultaneous recording of the ballistocardiogram on one channel and phonocardiogram, ECG, or arteriogram on another was required. In the early studies, simultaneous records of all these phenomena were desirable, but at present, with more complete data on the relation of ballistocardiographic waves to circulatory events, this is not necessary for clinical purposes. Simultaneous recording of the ballistocardiogram and ECG, in addition to aiding in identifying component waves of the ballistocardiogram, furnishes important time relationships between the two. The time interval from the onset of the QRS complex of the ECG to the peak of the J wave of the ballistocardiogram is normally 0.25 second. This may be increased to 0.3 in disease states, indicating a lag in both left ventricular ejection and acceleration of the blood flow in the aorta (*4*).

Simultaneous recording of the ballistocardiogram and ECG in a single channel was accomplished by Gubner (*3*) by connecting the electrocardiograph to the patient, in any lead, in the usual way, and connecting the leads of the ballistocardiograph in parallel with this lead. A rheostat (variable resistance, zero to 1,000,000 ohms) is interposed in series in one of the limb

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(*2*) Dock, W., and Taubman, F.: Some technics for recording ballistocardiogram directly from body. Am. J. Med. 7: 751-755, Dec. 1949.

(*3*) Gubner, R.: Selective synchronous recording of ballistocardiogram and electrocardiogram on a single channel. Circulation 4: 239-241, Aug. 1951.

(*4*) Gubner, R.; Rodstein, M.; and Ungerleider, H. E.: Ballistocardiogram: normal standards and determinants of waves. Proceedings of Twenty-Third Scientific Session, American Heart Association. June 24, 1950. p. 24.

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leads. At zero, or low rheostat resistances, both ballistocardiogram and ECG are inscribed. The peak of the R wave of the ECG occurs just before, or with the H wave of the ballistocardiogram; the peak of the J wave occurs within 0.25 second

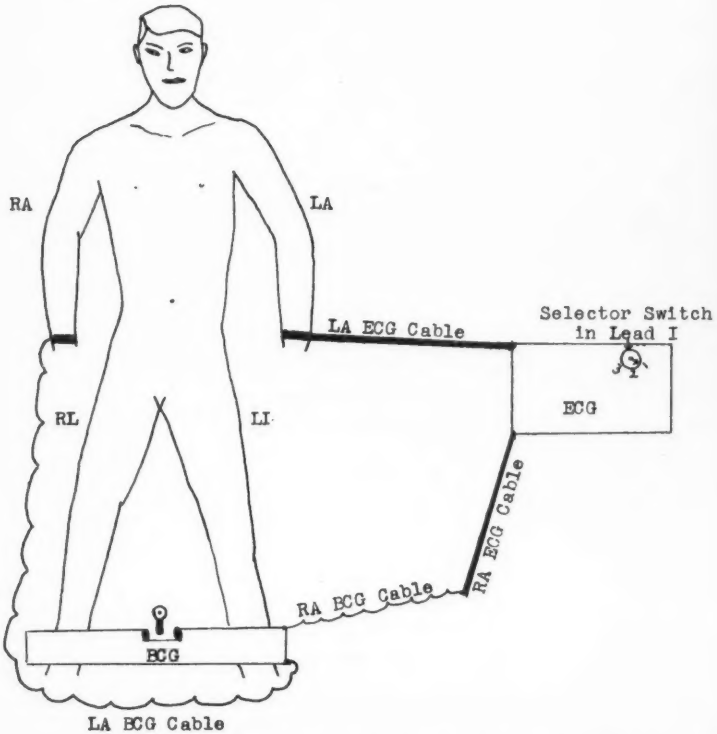

Figure 1. Ballistocardiograph and electrocardiograph connected in series through the patient. The patient's left arm is connected in the usual manner to the left-arm cable of the electrocardiograph. The right arm of the patient (using an ordinary extremity electrode) is connected to the left-arm cable of the ballistocardiograph. The right-arm cable of the ballistocardiograph completes the circuit by connection with the right-arm cable of the electrocardiograph. This gives the curve shown in figure 2A, when the lead selector switch of the electrocardiograph is on lead I.

from the onset of the QRS complex *(3)*, just as in a 2-channel recording. In order to obliterate the ECG from the record, the rheostat resistance is increased to 500,000 ohms or more, until the R wave is barely discernible; the ballistocardiogram remains unchanged.

Dock *(5)* indicated that the ballistocardiograph can be connected in series with the electrocardiograph through the patient and simultaneous inscription of records accomplished. Although this method is apparently known and used by many, it has not, to my knowledge, been illustrated anywhere, nor have records so obtained been published.

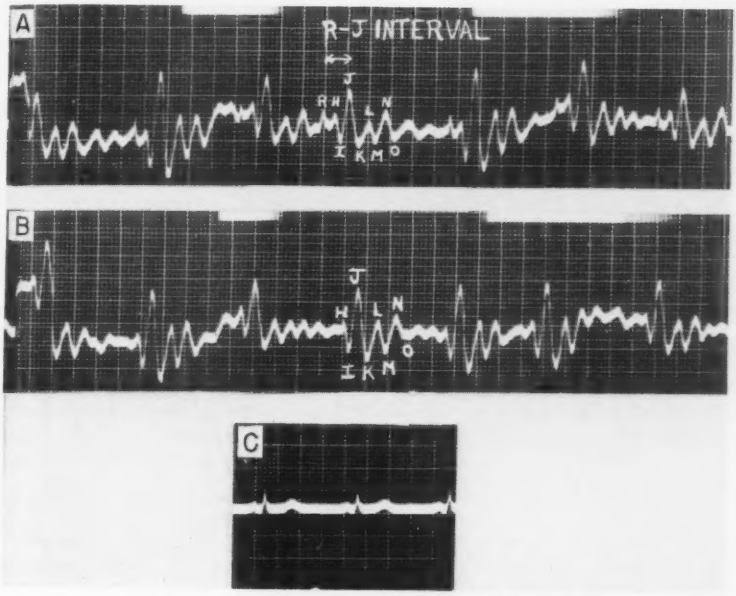

Figure 2. (A) *Simultaneous recording of ECG and ballistocardiogram in series through patient. (1 mv. = 1 cm.)* (B) *Ballistocardiogram without ECG. (1 mv.=1 cm.)* (C) *ECG in lead I. (1 mv.=1 cm.) The time interval from the onset of the QRS complex to the peak of the J wave is obtained by measuring from the peak of the R wave (ECG) to the peak of the J wave in* (A) *and adding to it the time from the onset of the QRS complex to the peak of the R wave in* (C).

An electromagnetic ballistocardiograph, of the type described by Dock *(5)* was used. Records were obtained at least 3 hours after the patient's last meal with the patient in the supine position, on a firm x-ray table, after having first obtained a 12-lead ECG. The connection of the patient in series, through the ballistocardiograph and electrocardiograph, is shown diagrammatically in figure 1.

Inspiration was marked on the record by holding down the lead marker, leaving a white strip on the upper edge of the tracing during this phase of respiration (fig. 2, A and B). The tracing

(5) Dock, W.: Personal communication.

was run during quiet, normal breathing. (Any special phase of respiration may be obtained subsequently.) With our ballistocardiograph, optimal deflection in the normal was obtained with the galvanometer standardized at 1 cm.-1 mv. To be certain that footward deflection was inscribed downward on the tracing, the patient was tapped lightly on the shoulder at the beginning and end of the record.

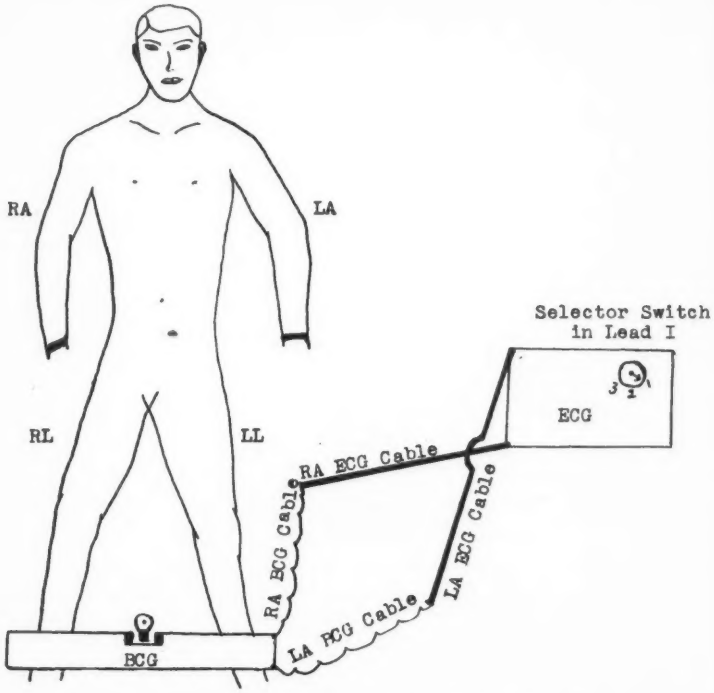

Figure 3. Ballistocardiograph connected directly to the electrocardiograph. The left-arm cable of the electrocardiograph is connected with the left-arm cable of the ballistocardiograph; the right-arm cables are similarly connected to each other. This produces the curve shown in figure 2B, with the lead selector switch of the electrocardiograph in lead I.

After recording the combined ECG and ballistocardiogram in series (fig. 2A), the patient's arms were disconnected from the electrocardiograph and the ballistocardiograph wires were connected directly to the electrocardiograph (fig. 3) This tracing (fig. 2B), when placed under the synchronous record of the ballistocardiogram and ECG, showed clearly all the waves of the ballistocardiogram.

The time interval from the onset of the QRS complex to the J wave by this method was 0.25 second (fig. 2, A and C). Certain abnormal tracings *(6)* showed prolongation of this interval. The relation of the H wave of the ballistocardiogram to the R wave of the ECG was indistinguishable from that obtained when recorded in parallel. It was further observed, using the parallel circuit of simultaneous recording of Gubner *(3)*, that the rheostat served as an antenna for picking up alternating current interference, in spite of patient and electrocardiograph grounding, and rheostat shielding. With the series connections shown in this study, alternating current interference was much rarer. The only difference in apparatus was the elimination of the rheostat.

The alternating current interference with the parallel connection could be attributed to the use of an x-ray table in a room with high tension wires, but the same room and table were used for the series method. Gubner *(7)* indicated that he encountered the same tendency to pick up alternating current interference, but that by shielding the rheostat he had no trouble eliminating it. Another difference between the two methods is that in parallel connection the sensitivity of the galvanometer is less than when the events are recorded by connection in series. Although the method of connecting in parallel for simultaneous recording would appear simpler, in actual practice the series connections take no longer, and once mastered, the method is simple.

SUMMARY

Identification of ballistocardiographic waves can be simply accomplished by simultaneous recording of any event of the cardiac cycle. By connecting any electrocardiographic lead, in series, with a ballistocardiograph, simultaneous inscription in a single channel may be obtained. By disconnecting the patient's extremities from the electrocardiographic circuit, the ballistocardiogram may be singly recorded and compared with the dual record. This eliminates the necessity for multichannel recording in clinical ballistocardiography.

(6) Green, M. H.: Unpublished data.
(7) Gubner, R.: Personal communication.

BOOK REVIEW

Atlas of Medical Mycology, by *Emma Sadler Moss,* B. S., B. M., M. D., Director, Department of Pathology, Charity Hospital of Louisiana at New Orleans; Clinical Professor of Pathology, Louisiana State University School of Medicine; Fellow, American Society of Clinical Pathologists; Fellow, American College of Physicians; Member, Association of Pathologists and Bacteriologists, College of American Pathologists, Society of American Bacteriologists and American Society of Tropical Medicine, and *Albert Louis McQuown,* B. S., B. M., M. D., Pathologist, Our Lady of the Lake Sanitarium, Baton Rouge, La.; Clinical Assistant Professor of Pathology, Louisiana State University School of Medicine; Fellow, American Society of Clinical Pathologists; Fellow, College of American Pathologists, and Association of Pathologists and Bacteriologists; Formerly Assistant to the Director, Department of Pathology, Charity Hospital of Louisiana at New Orleans. 245 pages; illustrated. Williams & Wilkins Co., Baltimore, Md., publishers, 1953. Price $8.

Although mycology is even older than bacteriology, it is assuming ever-increasing importance in clinical practice and laboratory diagnosis. The authors' association with the Charity Hospital of New Orleans has afforded them a large experience with the various methods used in the clinical and laboratory diagnosis of fungus diseases. As a result, they have produced a well-illustrated atlas designed primarily for the training of medical students, residents, and technologists. This book makes good use of the visual aid technic of teaching. Eighteen of the 25 chapters deal with specific fungi or clinical entities caused by them. Other chapters cover the classification of fungi, methodology, immunology, contaminants, culture media, and terminology. The propriety of including a formulary in this handbook of laboratory diagnosis is questioned.

The numerous photographs which illustrate clinical and roentgenographic features, colony characteristics of fungi on various culture media, identifying microscopic structures, and gross and microscopic pathology are generally well chosen. It is difficult to account for the omission of any gross pictures or low-power photomicrographs of the characteristic brain lesions of cryptococcosis.

The authors have made a systematic comparison of colony characteristics of the various fungi on the conventional Sabouraud agar and on the newer Littman oxgall agar. This should prove helpful to the clinical laboratory worker who has been confused by the different appearance of colonies on these two media. Specific references are not provided for the individual chapters, but a short bibliography precedes the index.

—Lt. Col. L. E. Zimmerman, MC, USA

DENTOALVEOLAR ABSCESS

Preliminary Report of the Use of a Multiple Antibiotic and Fungicidal Preparation in Its Treatment

PAUL A. KROOKS, *Captain, DC, USAR (1)*

BECAUSE of the continued shortage of personnel in the Dental Corps, a sufficient amount of time to devote to prolonged root canal treatments has not been available. Therefore a method which would meet the following requirements in treating dentoalveolar abscess or necrosis of the pulp due to traumatic injury, infection, or chronic irritation has been sought: (1) It must be therapeutically sound and clinically effective; (2) the materials must be readily available, durable, stable, and easily prepared; and (3) the technic must be simple, involve easily standardized equipment, and require a minimum of time.

The successful use of a multiple antibiotic and fungicidal preparation (MABF), described by Bender and Seltzer *(2)*, awakened interest at this clinic in its possible use on a large scale. This report will indicate the technic which I have used. In all but the first case, this technic was used in a routine manner.

THERAPEUTIC AGENT

A 15-cc. solution of chloramphenicol, streptomycin, penicillin, and sodium caprylate was prepared by the pharmacy of the William Beaumont Army Hospital in the manner described by Bender and Seltzer.

"* * * 200 mg. each of streptomycin (chloride), chloramphenicol, and sodium caprylate were placed in a sterile mortar. These powders were well triturated for 10 to 15 minutes. To this was added a commercially available 1-cc. aqueous suspension of 300,000 units of procaine penicillin G. The entire mass was again triturated for 5 minutes with a sterile pestle until a homogeneous mass was obtained."

Bender and Seltzer recommended further that this mass be transferred to used sterile procaine carpules. I did not do this,

(1) Dental Clinic, Fort Bliss, Tex., at time of writing; now at 2601 Glenwood Road, Brooklyn 10, N. Y.

(2) Bender, I. B., and Seltzer, S.: Combination of antibiotics and fungicides used in treatment of pulpless tooth. J. Am. Dent. A. 45: 293, Sept. 1952.

but instead drew the desired amount each time from a sterile bottle using a Luer-Lok syringe. No cultures were taken because if the technic were to be of value under the conditions which prevail in most clinics, facilities for obtaining cultures not being available, the necessity of taking cultures would then render the technic of little practical value. For these reasons the root canals were filled and the case closed when there were no objective and subjective symptoms.

CASE REPORTS

Case 1. On 27 October 1952 a 21-year-old soldier reported to this clinic complaining of pain in the upper right central and lateral incisors. The pain had started 2 days previously. The tissue superiorly had begun to swell the day before and at the time of examination was only moderately edematous. Roentgenograms showed large silicate fillings on the central and evidence of caries on the lateral incisors. The apex of the lateral incisors showed moderate radiolucency. The pulp of both teeth seemed nonvital.

The teeth were isolated with cotton rolls and scrubbed first with alcohol then with merthiolate. The instruments used were sterilized by boiling. The root canals were opened and about 1.5 cc. of MABF was flushed through each canal after it had been reamed and filed in a standard manner. A sterile point was inserted into each canal and it was sealed first with gutta-percha and then a layer of cement. The patient was given 600,000 units of procaine penicillin intramuscularly, placed in quarters, and told to use ice on the swollen tissues for 5 minutes, rest 20 minutes, and repeat.

On the following day the edema had increased, pain persisted, and the teeth were highly sensitive to percussion. The dressing was removed from the teeth and the canals were left open for drainage. The patient was given another 600,000 units of penicillin intramuscularly, continued in quarters, and told to continue to apply ice. On the next day the edema and the pain had decreased. The application of ice was continued, and 300,000 units of penicillin was given. On 30 October the patient had only a slight tenderness in the lip and slight edema. He was given 300,000 units of penicillin and returned to duty. On 3 November he had neither pain nor edema.

On 7 November both root canals were filled with gutta-percha points (in chloroform), and apicoectomies were performed on both teeth. Sutures were taken and the patient was given 600,000 units of procaine penicillin intramuscularly. By 11 November the incision had healed by primary intent, the sutures were removed, and the patient was discharged.

Comment. It was immediately apparent that there was something amiss either with the MABF solution or with the technic which was being used. The pharmacy was requested to prepare a new batch of MABF, using greater care to prevent contamination, and the technic was revised as follows: (1) A rubber dam was used consistently; (2) the area was scrubbed with alcohol for 2 minutes, followed by liberal washing with ether; (3) a root canal tray was prepared, wrapped in a towel together with the Luer-Lok syringe and needle (from which the point had been filed), and this kit was autoclaved and stored until used; and (4) when the symptom had subsided, a dam was again applied and the canal filled with gutta-percha. Because this technic was used routinely in the following case reports it will not be described again.

Case 2. On 3 November 1952 a 24-year-old man reported to the clinic complaining of pain in the upper left lateral incisor. The tooth was nonvital and painful on percussion, but there was no edema. The canal was flushed with MABF and sealed. On 13 November the symptoms had subsided so the root canal was filled.

Comment. Each patient was given a letter explaining what had been done. He was instructed to present himself to the nearest service clinic in 6 months for roentgenograms of the involved area, the roentgenograms to be sent to me.

Case 3. A 31-year-old man reported to the clinic on 20 November 1952 complaining of pain in the upper right incisor area noted only while chewing. The incisor was sensitive to percussion and nonvital. The roentgenogram revealed a large radiolucent area at its apex. The canal was opened, cleaned, and treated with MABF. On 4 December the patient reported no further discomfort so the canal was filled with chloropercha.

Case 4. A 29-year-old man reported on 25 November 1952 to the clinic stating that about 15 days earlier he had noticed a swelling in the upper lip above the left lateral incisor. The swelling disappeared but about 5 days later, while brushing his teeth, he pressed against the gum above this tooth and purulent fluid began to drain from a raised opening in the gum. This swelling and draining had recurred several times. Roentgenograms revealed a large, irregular, radiolucent area involving the apex of the lateral incisor. There was a fistulous opening in the labial mucosa 7 mm. above the gingival margin. The canal was cleaned and treated with MABF. By 5 December the edema had disappeared. There was a slightly reddened area at the spot where the fistula had opened. The tract seemed to be closed or beginning to close. The patient had no further pain or edema

so the root canal was filled. The fistulous opening had completely disappeared by 13 December.

Case 5. On 2 December a 21-year-old man reported to this clinic complaining that in the preceding 2 days the upper right central incisor had been sensitive to cold. At the time of examination he had a steady dull ache in this region. The tooth had been filled with silicate 4 or 5 years earlier. It was extremely sensitive to percussion at the time of examination. The root canal was opened for drainage and left open until the following day, at which time there was no pain or edema. It was cleaned and treated with MABF. By 12 December there were still no symptoms so the canal was filled.

Case 6. A 28-year-old man reported to this clinic on 8 December 1952 complaining of an aching pain in the upper right cuspid of 2 days' duration, associated with swelling in the infraorbital fossa. Roentgenograms revealed radiolucency at the apex of this tooth. The canal was opened and left open for drainage. On 9 December the canal was cleaned and treated with MABF. On 16 December the symptom had subsided so the canal was filled.

Case 7. An 18-year-old man reported to this clinic on 12 December 1952 complaining of a dull ache in the upper right lateral incisor off and on for about 6 weeks. There was neither pain nor soreness to percussion at the time of examination. A rarified area had been discovered at the apex of this tooth in a roentgenogram. The tooth was opened, cleaned, and treated with MABF. On 19 December the symptoms had cleared up so the root canal was filled.

Case 8. On 22 December 1952 a patient reported to the clinic complaining of an intermittent throbbing pain in the upper left central incisor of 1 day's duration. The tooth was nonvital, discolored, and sensitive to percussion. There was no edema in the supportive tissues. The tooth was opened for drainage and on 23 December treated with MABF. On 31 December the symptoms had subsided so the tooth was filled.

Case 9. A 21-year-old man reported to the clinic on 10 December 1952 complaining that the upper left lateral incisor was sensitive to percussion. On the previous night he had had severe intermittent pain radiating from the area. The tooth was partially vital, giving evidence of sharp pain on the application of either heat or cold. It was opened under anesthesia; the canal was reamed, cleaned, and left open for drainage. On 11 December, there being no pain on percussion, nor other manifestation of

inflammation, the tooth was treated with MABF. On 23 December the canal was filled.

CONCLUSIONS

The use of MABF in the treatment of pulpless teeth is a highly effective method of controlling infectious processes. The method of treatment can be standardized to facilitate its routine use.

No undesirable side reactions were observed once the technic had been standardized. The first patient was the only one who complained of pain subsequent to the use of MABF.

Further study of the mechanism of action of the drugs is indicated. This report was submitted in the hope that it might stimulate others to attempt the use of MABF.

BOOK REVIEWS

Human Factors in Air Transportation, Occupational Health and Safety, by *Ross A. McFarland,* Ph. D., Associate Professor of Industrial Hygiene, Harvard School of Public Health. 830 pages; illustrated. McGraw-Hill Book Co., Inc., New York, N. Y., publishers, 1953. Price $13.

If I could ever be credited with having written a book, this new book of McFarland's is one I would be proud to have written. It is a learned compilation of the present state of the knowledge of human factors in flying. The aero medical, human engineering, and social scientists engaged in forwarding flying progress could well re-evaluate their orientation by reference to this volume so as to find the deficient areas in the human factors of aviation and then to proceed in these weak areas. Every flight surgeon, airline medical director, and flight examiner will find here an encyclopedia of human factor knowledge to supplement current texts of aviation medicine, aviation psychology, et cetera. The aircraft designers and other "hard scientist" will find in this volume a fitting companion to McFarland's other volume "Human Factors in Air Transport Design" and thus will insure proper consideration of the man in future aircraft, be that man an operator or a passenger. The pilots will find here the answers to many of their questions and an explanation of why their medical departments frequently react as they do.

The size of this volume with its text, charts, references, and index reveal that this is no short and easy flight for the reader.

Rather, it is a learned, detailed, carefully written, and carefully edited book. It contains very few errors. The author is to be praised for his inclusion of scores of figures, charts, and graphs to supplement the text, and much could be learned simply by studying these figures. An opening sentence in each chapter stating the subject and the approach to be followed in the presentation and the excellent summaries at the end of each chapter facilitate the use of this book. An extensive bibliography accompanies each chapter.

I happen to have been an observer at a meeting in which experts on sound attacked the author's views on auditory surveys (starting on page 477 of the present text), and I can state that this discussion terminated with the acknowledgement that the premises of this book are tenable and the conclusions sound. Here, as in all the other chapters, much of the detail of what is known has had to be omitted in order to present this broad subject in a single volume. The author's knowledge of psychology, his long research in and teaching of biologic sciences, and his love for and experience in aviation have enabled him to use the specialized language of each but makes it necessary for a person of more limited background to use the dictionary and the basic references frequently.—*A. H. Lawton, M. D., Ph. D.*

Direct Analysis, Selected Papers, by *John N. Rosen*, M. D. 184 pages. Grune & Stratton, New York, N. Y., publishers, 1953. Price $3.75.

This book consists of a number of papers, most of which have been published in periodicals in the past 6 years. The term "direct analysis" refers to the specific technic Rosen has developed in the treatment of schizophrenic patients. Instead of using long hours of free association with little interpretation as is the case with neurotics, Rosen interprets the schizophrenic's symptoms and productions directly. No free association is used. In so doing, Rosen uses plain everyday language with a liberal sprinkling of good old-fashioned Anglo-Saxon words which leave no doubt about their meaning. He enters the patient's fantasies when necessary. He may use restraint or even engage in physical combat during critical phases of treatment when the patient's aggression is suddenly released. He reports many successfully treated patients, one of whom had been ill for 27 years. Although the author admits he does not understand all that occurs during treatment, his method is certainly challenging. The book is clear and is singularly free of psychoanalytic jargon. It is fascinating reading and should be read by all serious students of psychiatry.

—*Lt. Col. J. F. Tuttle, MC, USA*

AN EPIDEMIOLOGIC STUDY OF TUBERCULOSIS IN CIVILIAN EMPLOYEES

JAMES R. MATHEWS, *Lieutenant, junior grade, MC, USNR (1)*

IN May 1952, a roentgenographic survey of all civilian employees of the Overhaul and Repair Department at this station was conducted. The Industrial Medicine and X-Ray Departments insisted that all employees be x-rayed. The industrial medicine officer devised a system by which none would be missed. Punch cards were made for each employee, and as he appeared for his roentgenogram, the card was stamped with the x-ray serial number and the date. His age, weight, height, and place of birth were also recorded on the card. When the films had been read, the findings were reported on the cards. Those employees whose cards had not been used were called individually until all had been x-rayed. About 3,300 men and women were x-rayed.

At this time, 8 employees were found either to have tuberculosis or to have a suspicious lesion which later proved to be tuberculosis. All but 2 had worked in the Overhaul and Repair Department 4 years or more. One of these 8 employees (case 1) had concealed an active tuberculosis for at least 3 years. Of the remaining 7, cases 2, 3, and 4 were from the same division (power plant), and at least one of them (case 2) worked in close contact with case 1. Another employee from the same division (case 9) had been found to have tuberculosis in the preceding year. He had also worked in close contact with case 1.

Of the other 4 found in this survey, case 5 had been in the Planning and Engineering Division of the Overhaul and Repair Department for 1 year, and another (case 6) worked in the Plant Maintenance Division of the same department. Both of these men had jobs which took them to most of the other divisions in the department. Cases 7 and 8 worked in divisions where they were not apt to have had extensive contacts with members of other divisions.

Besides the 8 patients found in this survey and the 1 from the previous year, 2 others had brief contacts with the Overhaul and

(1) U. S. Naval Air Station, Jacksonville, Fla.

Repair Department. One man was transferred here from another naval base in March 1952, and on a routine roentgenographic survey was found to have active tuberculosis. He worked in the Production Office, where he would have had close contact with case 5 in the Planning Division. He was here for only a few days before the lesion was found and he was removed from the job and admitted to the hospital. The other was a clerk-typist who had previously been treated and had begun to work in April, stating that she had been told her disease was arrested. Although a review of her case suggested that she should not yet return to work, about 2 months had elapsed before this was determined, during which time she also worked in the Planning Division.

It is possible that case 5 might have contracted tuberculosis from one of these latter two, although he had had contact with most of the other departments too.

CASE REPORTS

Case 1. This man was treated for tuberculosis in 1932, again in 1941 and 1942, and was subsequently followed by the Veterans Administration as an outpatient. He was employed in the Overhaul and Repair Department in 1943, at which time it was thought that his tuberculosis was arrested. In 1949, because of suspicious-looking changes on his roentgenograms, sputum studies were made and found to be positive. He was advised to enter a Veterans Administration hospital, but he refused to do so. The city health department was notified and both agencies were apparently under the impression that he was being treated at home. Neither was aware that he had been employed at this station. He successfully concealed his infection for at least 3 years. During this time he was in the same departments with cases 2, 3, 4, and 9, and worked with cases 2 and 9 constantly. In addition, he had transient contact with cases 5 and 6. He was found to have active, moderately advanced tuberculosis in the May 1952 survey. Although he had worked at this station since 1943 he had never had a chest roentgenogram by the Navy because he had always absented himself from work on the days roentgenographic surveys were made. He had managed to do this for 9 years because accurate lists of employees who did not report to be x-rayed had not been kept.

Case 2. This man, employed here since 1942, worked in the power plant in close contact with case 1. He was found to have active, moderately advanced tuberculosis in the May survey. Cases 1 and 2 spent most of their time in the power plant but their jobs occasionally took them to other divisions. This man had had a negative 70-mm. roentgenogram in December 1950.

Case 3. This man had worked in the power plant since 1943, but his contact with cases 1 and 2 was casual. A roentgenogram taken in August 1951 showed a lesion similar to the one found in the May survey. Because of a slight difference in the 2 films, however, he was referred to his family physician, who believed that the disease was active.

Case 4. This man had worked in the power plant since 1946, in a contact situation similar to that of case 3. He had been treated by the Veterans Administration in 1949 and 1950 for active tuberculosis and was being followed by them. Because of a change in his roentgenographic findings, he was referred back to the Veterans Administration where further examination revealed evidence of active disease.

Case 5. This man began work in the Planning, Engineering, and Personnel Division in April 1951, at which time he had a negative 70-mm. roentgenogram. In May 1952, suspicious-looking findings were noted and he was referred to his family physician, who believed that he had active minimal tuberculosis and referred him for hospitalization. His work had put him in contact with most of the other divisions in the department, including the power plant.

Case 6. This man had worked in the Plant Maintenance Division since 1948 in a job which took him to most of the other divisions. He had been hospitalized in 1949 with "pleurisy." While in the hospital, a diagnosis of rheumatic carditis was made, and a roentgenogram at that time showed normal lung fields. In the May survey, he was found to have active minimal tuberculosis.

Case 7. This man had started to work in the Radio Repair Division in November 1951 (6 months before the survey was made). At that time he had a negative 70-mm. roentgenogram. In the May survey, a small peripheral shadow was found, which, at the time, was thought to be a small area of pleural thickening. Serial films were taken at bimonthly intervals. A film taken in August showed no apparent change, but, in retrospect, there was a question of a slight change in the shape of the lesion. In September, the patient had a "severe chest cold," which lasted for 3 weeks. A roentgenogram in October showed a cavity 2.5 cm. in diameter with marked infiltration around it, and the patient's sputum was found to be positive for tubercle bacilli.

Case 8. This man had worked in the Processing Division in a fairly stationary job since 1941. He had been recalled in 1951 because of what was believed to be an old, inactive, tuberculous lesion. Serial roentgenograms had been suggested at that time. In the May film, no change was apparent, but the serial films were

continued. A roentgenogram taken in November 1952 showed, in addition to the old, fibrous lesions, a new, softer area of infiltration. The patient was referred for further study to the local Board of Health, where his sputum was found to be positive for tubercle bacilli.

Case 9. This man was found to have active tuberculosis on reporting to a new job, after leaving here. He had worked in the power plant in close contact with cases 1 and 2, but had had a negative 70-mm. roentgenogram shortly before being transferred to the new job.

SUMMARY

During a routine, annual, roentgenographic survey of civilian employees, a deliberately concealed case of active tuberculosis was found. Several other patients with active tuberculosis were found in the same survey, many of whom may have been contracted directly from the concealed case. This clearly illustrates the value of the annual examination and the extreme importance of insisting that all employees be x-rayed. A system using punch cards to insure that none be missed is recommended.

BOOKS RECEIVED

J. Meller Ophthalmic Surgery, A Handbook of Surgical Operations on the Eyeball and Its Appendages. 6th edition, revised and enlarged, by Professor Dr. *J. Böck,* with a Supplement by *K. Kofler.* Translated and edited by *Ray K. Daily,* M. D., F. A. C. S., and *Louis Daily, Jr.,* B. S., M. D., Ph. D. (Ophth.), F. A. C. S. 529 pages; illustrated. The Blakiston Co., New York, N. Y., publishers, 1953. Price $12.

Roentgen, Radium, and Radioisotope Therapy, by *A. J. Delario,* M. D., Member of the American College of Radiology; American Board of Radiology; Radiological Society of North America; Head of Therapeutic Radiology, St. Joseph Hospital, Paterson, N. J. 371 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1953. Price $7.50.

Textbook of Functional Jaw Orthopaedics, by Professor *Karl Häupl,* M. D. (Innsbruck), Professor of Dental Surgery, University Dental School, Innsbruck; late Professor of Dental Surgery, University Dental School, Prague; late Professor of Dental Surgery, State Dental School, Oslo; *William J. Grossmann,* M. D. (Prague), L. D. S., R. C. S., Eng., Orthodontic Consultant and Lecturer in Orthodontics, University College Hospital Dental School, London; and *Patrick Clarkson,* M. B. E., M. B., B. S., (Lond.) F. R. C. S., Honorary Civilian Consultant Plastic Surgeon, The Queen Alexandra Hospital, London; Plastic Surgeon, Ministry of Health; Casualty Surgeon, Guy's Hospital; Consultant Plastic Surgeon, London County Council; Plastic Surgeon, Royal Northern Hospital. 408 pages; illustrated. The C. V. Mosby Co., St. Louis, Mo., publishers, 1952. Price $12.

A MODIFICATION OF THE ILEOCOLOSTOMY

With Exclusion Operation for Terminal Ileitis

HAROLD F. BERTRAM, *Lieutenant Colonel, MC, USA (1)*

ALTHOUGH terminal ileitis has been recognized as a definite clinical entity for over 20 years *(2)*, the cause is still unknown and the treatment is unsatisfactory. Medical, radiologic, and surgical therapeutic measures have been tried. I believe that medical treatment should be continued so long as it maintains the patient as a useful, self-supporting member of society, able to enjoy his life and that surgical treatment should be offered the patient only when medical treatment fails. The standard surgical procedures are excision of the involved segment of the intestinal tract and of ileocolostomy with exclusion, as popularized by Garlock *(3)*.

I have used the latter, with a minor modification, because (1) it is definitely a safer procedure (the mortality is practically zero); (2) according to available statistics, it offers as good, if not better, long-term results; and (3) if this procedure fails to relieve the patient's symptoms, we may still resect a part of the intestinal tract as a last resort. Regardless of the surgical procedure used, the recurrence rate is discouragingly high *(4-8)*.

Garlock used a left midrectus incision because it eliminates the possibility of having to work through an inflammatory mass

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(1) U. S. Army Hospital, Fort Campbell, Ky.

(2) Crohn, B. B.; Ginzburg, L.; and Oppenheimer, G. D.: Regional ileitis; pathologic and clinical entity. J. A. M. A. 99: 1323-1329, Oct. 15, 1932.

(3) Garlock, J. H.: Present status of problem of regional ileitis. Am. J. Surg. 72: 875-878, Dec. 1946.

(4) Garlock, J. H., and Crohn, B. B.: Appraisal of results of surgery in treatment of regional ileitis. J. A. M. A. 127: 205-208, Jan. 27, 1945.

(5) Hawthorne, H. R., and Frobese, A. S.: Chronic stenosing regional enteritis--surgical pathology and experience in surgical treatment. Ann. Surg. 130: 233-241, Aug. 1949.

(6) Bockus, H. L.: Present status of chronic regional or cicatrizing enteritis. J. A. M. A. 127: 449-456, Feb. 24, 1945.

(7) Warren, R., and Miller, R. H.: Regional enteritis; report of 43 cases. New England J. Med. 226: 589-593, Apr. 9, 1942.

(8) Garlock, J. H.; Crohn, B. B.; Klein, S. H.; and Yarnis, H.: Appraisal of long-term results of surgical treatment of regional ileitis. Gasteroenterology 19: 414-423, Nov. 1951.

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to find uninvolved bowel and it leaves the right side of the abdomen as free of adhesions as possible in case a resection is necessary later. This incision, by avoiding the involved area, lessens the chance of formation of a fistula. Existing fistulas should be left absolutely alone because they heal spontaneously after exclusion. It is important to transect the bowel proximal to the site of involvement before ileocolostomy is performed. Garlock stated that ileocolostomy in continuity gives no relief and, in fact, often makes the patient worse.

After transecting the bowel proximal to the most proximal lesion, Garlock closed the distal end and replaced it in the peritoneal cavity. He believed that after this procedure the inflammatory process would subside. Many conservative surgeons, however, condemn this procedure because they believe that as the bowel heals, after it has been short-circuited, it often becomes stenosed by scar tissue. It would then be possible for a closed loop obstruction to develop between the stenosed area and the surgically closed end of the ileum. This could conceivably result in distention, perforation, peritonitis, and even death. At the very least, this would be a troublesome and disconcerting complication. It was to circumvent this possibility that the procedure to be described here was adopted. This objection to Garlock's procedure could be met by bringing out the distal end of the ileum as a mucous fistula. A mucous fistula is not so objectionable as an ileostomy or a colostomy, but it presents conditions that are undesirable to most patients. I believe that the procedure to be described (and which I did not originate) circumvents the objections to both of the other procedures.

After the diagnosis of terminal ileitis is established, the patient is prepared in the manner usually used for operations on the colon. The abdomen is opened through a left midrectus incision. Sufficient exploration is done to confirm the diagnosis. Then, because the presence of "skip areas" between areas of involvement is common in this disease, and to avoid transecting the ileum through one of these skip areas and distal to an area of involvement, the ligament of Treitz is identified. The small bowel is traced distally from this point until the first area of involvement is encountered. It is then traced for 18 inches proximal to any gross involvement. At this point the bowel is transected. The proximal end is anastomosed to the side of the transverse colon. (I have no quarrel with surgeons who prefer side-to-side re-establishment of intestinal continuity.) The distal end of the ileum is closed in the manner used to close the duodenum in a gastric resection. At this point the operation differs from that of Garlock. The closed distal end is brought partially through the left midrectus incision. The split mesentery of the

small bowel is sutured to the peritoneum of the anterior abdominal wall, from the incision to the ileocolostomy, to avoid a possible internal hernia. The left rectus incision is then closed around the blind distal end of the terminal ileum up to and including the subcutaneous fat. The skin is then closed over the end of the terminal ileum (fig. 1, A and B).

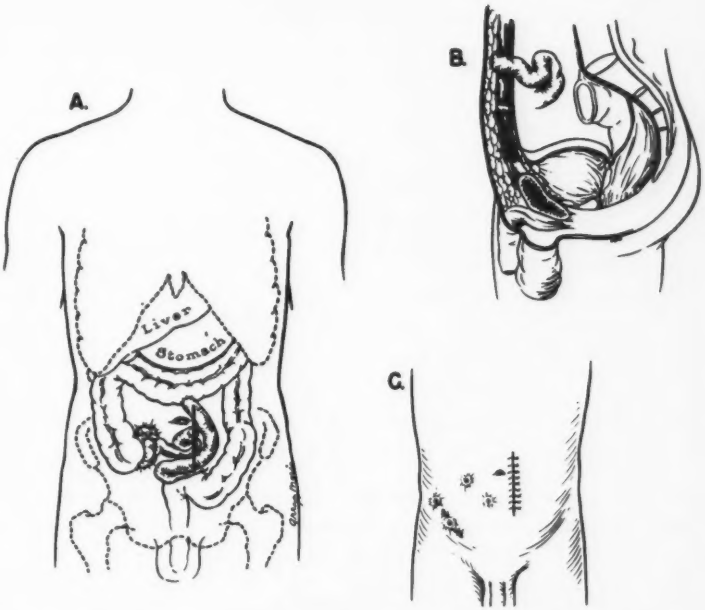

Figure 1. Diagram of completed operation. (A) *Front view.* (B) *Side view.* (C) *Case 1 after completion showing fistulas and incision.*

With this procedure, if the patient develops signs of a closed loop obstruction, a surgeon can, under local anesthesia, create a mucous fistula simply by incising the skin and bowel immediately beneath the skin. Before discharge the patient is given a diagram of his operation with the incision drawn in. The spot on the incision where the blind loop is buried is marked and referred to the umbilicus and the anterior superior spine of the ilium. The patient's diagnosis is also written on the diagram to avoid confusion. With this information any physician can provide emergency treatment for a closed loop obstruction and prevent the unpleasant complication of perforation. I have used this procedure in treating 3 patients without undesirable complications.

CASE REPORTS

Case 1. A man was operated on on 2 February 1949. He had had an appendectomy several months previously. He had lost about 50 lb. and had had 3 operations to drain "abscesses" about his appendectomy incision. He had 4 fistulas opening on his abdominal wall (fig. 1C). Within 10 days after ileocolostomy with exclusion his fistulas had closed spontaneously and he was free of pain. He had no diarrhea. He regained his weight within a few months and has retained it for over 3 years. He worked for a time in a steel mill and then rejoined one of the Armed Services. When last heard from, 3 years after operation, he weighed 187 lb. and was taking training in a parachute rescue squadron.

Case 2. A man was operated on on 28 February 1949 for terminal ileitis. He had had symptoms for 6 years. An appendectomy had been performed previously and the diagnosis of terminal ileitis was established at that time. Because of pain, weight loss, and diarrhea, he sought relief. Following ileocolostomy with exclusion he was free from pain, gained 35 lb., and held his weight except during the summer months. He had an average of 3 soft bowel movements daily but was able to carry on a useful and happy life.

Case 3. A man was operated on on 25 May 1951. He had had symptoms for 2 years. Nine months after the ileocolostomy with exclusion he had gained 15 lb. He was free from pain and had no diarrhea except after 2 episodes of excessive use of alcohol. He also performed duty as a naval combat pilot, completing his share of combat missions over Korea.

None of these patients developed an incisional hernia.

SUMMARY

A modification of the procedure advocated by Garlock was used on 3 patients. This operation meets the objection of conservative surgeons that as the bowel heals it may become stenosed by scar tissue. It also avoids the inconvenience to the patient of a mucous fistula.

SUBCOMA, COMA, AND CONVULSIVE CARBON DIOXIDE THERAPY[1]

WILLIAM E. WILKINSON, *Colonel, MC, USA*

MANY psychiatrists are now using neurophysiologic measures to relieve the symptoms of various nervous and mental illnesses. Although Meduna (2) used carbon dioxide therapy with success, there is still much criticism of the use of such measures. Most of the psychiatrists who have spoken or written about the beneficial results obtained by the use of the neurophysiologic measures have stated that these methods are empirical. Therefore, it would seem that there is a justification for this criticism and if those of us who use these methods are to be scientific, we must make every effort to determine how and why we modify the courses of illnesses by the treatments that we are using. I have previously reported (3–5) certain observations pertaining to electroshock therapy which give some indication of the modus operandi of this particular treatment. This article is an initial effort to clarify some of the theories concerning the physiologic and psychologic changes which occur in patients who are undergoing carbon dioxide therapy. I have administered carbon dioxide to over 200 patients. The illnesses which have been treated include schizophrenia, manic-depressive psychosis, the various types of benign affective disorders, hysteria, psychoneurosis, and numerous psychosomatic illnesses.

Although the idea that patients receive no benefit from carbon dioxide therapy unless unconsciousness is produced by the administration of the gas mixture (30 percent carbon dioxide and 70 percent oxygen) seems to be prevalent, the physicians

(1) Read before meeting of the Southern Psychiatric Association, White Sulphur Springs, W. Va., 4 Nov. 1952.

(2) Meduna, L. J.: Carbon Dioxide Therapy; A Neurophysiological Treatment of Nervous Disorders. Charles C Thomas, Publisher, Springfield, Ill., 1950.

(3) Wilkinson, W. E.: Observations pertaining to electric shock therapy; somatic manifestations. Dis. Nerv. System 13: 227-232, Aug. 1952.

(4) Wilkinson, W. E.: Observations pertaining to electric shock therapy; autonomic manifestations. Dis. Nerv. System 13: 3-7, Dec. 1952.

(5) Wilkinson, W. E.: Observations pertaining to electric shock therapy; effects of certain drugs. Dis. Nerv. System. In press.

with whom I have talked agree that the degree of unconsciousness produced by carbon dioxide is extremely variable from patient to patient and even in the same patient from treatment to treatment. Some patients say they "passed out"; some that they went to sleep; some that they were "knocked out"; a few have said they "dreamed but did not go to sleep"; and others have said that they "floated away." I have elected to use the term "coma" to describe this change in consciousness because it is easier to say "subcoma" than to use some expression such as "subunconsciousness."

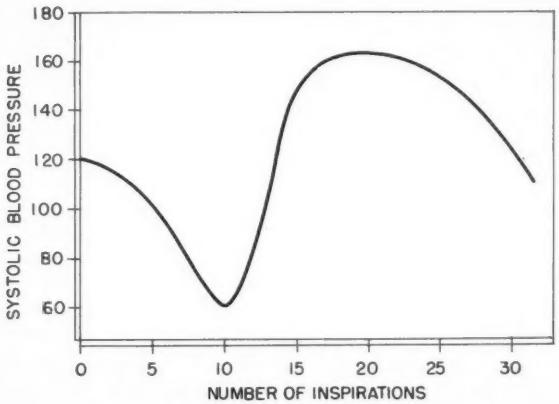

Figure 1. Characteristic blood pressure curve.

SUBCOMA THERAPY

In some patients there is evidence of a preponderance of parasympathetic activity at the beginning of a treatment but when the patient has received from 12 to 20 inhalations of the gas there is usually a marked response on the part of the sympathetic nervous system. If the treatment is continued to the point of producing unconsciousness, however, there is sometimes a second parasympathetic response. A characteristic blood pressure curve for such patients is shown in figure 1. Other patients had a sympathetic response initially and did not have a delayed parasympathetic response. A few patients responded only with a parasympathetic reaction throughout the treatment. As a result of the observations which previously have been made concerning autonomic response to electroshock therapy (*4*), it was decided that depressed patients who had a preponderance of parasympatheticlike symptoms might respond better if the treatment were discontinued at the level of sympathetic response. Because this sympathetic level usually occurs before the patient becomes unconscious, I soon found myself

giving many patients subcoma treatments. It has been gratifying to observe that most of these depressed patients have been relieved of their parasympatheticlike symptoms with the subcoma treatments. Therefore, I no longer use unconsciousness per se as the determining factor in deciding how much gas to administer in any one treatment.

COMA THERAPY

Patients who have psychoneurotic symptoms, but who are not depressed, have, in my experience, either not been improved or have been made worse by treatments which did not produce unconsciousness. Such patients now are routinely given coma treatments. The nature of the altered state of consciousness which occurs in patients who have been given a coma treatment without producing a convulsion is of interest. Unless there has been a convulsion, the "extinction of personality" *(6)* which occurs following convulsive electroshock does not occur. Many of these patients have had dramatic reactions during and following the treatment. Several patients have stated that they had an ecstatic experience and that they discovered the universal truth. Unfortunately they were unable to remember the solution when they awakened! Many have shown signs of violent autonomic nervous system discharge frequently accompanied by violent muscular activity. Several patients have screamed and yelled for long periods of time. Others have had uncontrollable fits of laughter or crying and sometimes the fits of crying and laughing alternate in the same patient. One or two patients have cried and laughed at the same time.

When these reactions are observed carefully, they sometimes give the impression that the patient has been stimulated into having the reaction. For example, one of the patients who had an ecstatic experience was very depressed prior to the treatment and was hypomanic after the treatment. On the other hand, other patients seemed to have these reactions as a form of catharsis. One tense, tremulous young man was given 0.15 mg. of epinephrine intravenously prior to the institution of treatment and this caused him to have a severe anxiety attack associated with a feeling that his heart was going to jump out of his chest. His tremor was exaggerated tenfold. He then received 5 carbon dioxide treatments, during each of which there was a marked sympathetic autonomic response accompanied by rather violent somatic activity. The intensity of these responses decreased with each successive treatment. Following the fifth treatment, he was again given epinephrine intravenously and his only reaction was a slight increase in pulse rate and blood pressure

(6) Löwenbach, H., and Stainbrook, E. J.: Observations on mental patients after electro-shock. Am. J. Psychiat. 98: 828-833, May 1942.

with no subjective symptoms. He and others like him have said that the treatments made them feel less tense, restored normal sleep, and improved their appetite. Such observations have led us to believe that the carbon dioxide (1) stimulates the central nervous system and probably the endocrine gland system and (2) facilitates the release of pent-up psychic energy.

CONVULSIVE THERAPY

We have used convulsive carbon dioxide therapy on patients who previously would have been given convulsive electroshock therapy. This group has included patients with schizophrenia, obsessive-compulsive neurosis, and those with the manic and agitated depressed phase of manic-depressive psychosis. These patients have shown tremendous variations in their convulsive threshold and in the intensity and duration of the convulsion. Following the carbon dioxide-induced convulsion, the patients go through the several stages of the awakening reaction *(3)* not unlike patients recovering from electric convulsive therapy. Patients who have been treated by this method usually have shown temporary relief of symptoms immediately after the treatment, but in most of them the improvement has not lasted for as long as 24 hours *(7)*. A few patients have been completely relieved of their symptoms but all of these were treated in the past year and we do not know how permanent the relief will be.

DISCUSSION

Many of the patients with so-called psychosomatic reactions had as their chief complaints symptoms which seemed to indicate overactivity or decreased activity of one or the other branches of the autonomic nervous system or one of the several possible combinations of autonomic imbalance. Frequently these patients denied any mood disturbance and no evidence of such disturbance could be obtained by talking to members of their families. The principal symptoms that we have encountered in such patients are listed in table 1. Not infrequently during the treatment of these patients a depressive mood disturbance appeared at the time that their somatic complaints were relieved. Three such patients have become depressed to the point of being suicidal. Because the depression became manifest as the somatic symptoms disappeared, the depression and the somatic symptoms seem to be related. This leads us to wonder whether these somatic symptoms should not be considered as depressive equivalents, and further suggests the possibility that some people are so constituted that they develop somatic complaints rather than a classical affective disorder and that their symptoms are perhaps defensive mechanisms. When these symptoms

(7) Loevenhart, A. S.; Lorenz, W. F.; and Waters, R. M.: Cerebral stimulation. J. A. M. A. 92: 880-883, March 16, 1929.

are then removed, the defensive mechanism is broken down and an affective disorder becomes manifest. One bit of evidence in favor of this hypothesis is the observation that 2 hysterical patients whose hysterical symptoms were relieved by carbon dioxide became suicidally depressed. The possibility that the carbon dioxide treatments themselves may have produced a depression which had no relation to the somatic symptoms must also be considered. Interestingly enough, the patients that have become suicidally depressed during carbon dioxide therapy have been relieved of their depression by electroshock therapy.

TABLE 1. *Psychosomatic symptoms*

1. Dry mouth	1. Rhinorrhea
2. Dry eyes	2. Tearfulness
3. Pounding heart	3. Fluttering heart
4. Tenseness and tremor	4. Fainting spells
5. Panting	5. Smothering spells
6. Localized, sticky sweating	6. Generalized watery sweating
7. Goose skin	7. Warm, flushed skin
8. Fearfulness	8. Crying spells
9. Loss of appetite	9. Abdominal cramps
10. Feeling of wanting to scream	10. Lethargy
11. Insomnia	11. Drowsiness
12. Inability to be still	12. No energy
13. Controllable urinary frequency	13. Uncontrollable urinary frequency
14. Spastic constipation	14. Diarrhea
15. Stomach in a "knot"	15. Vomiting
	16. Urticaria
	17. Pain

Two schizophrenic patients who were only mildly depressed prior to the institution of carbon dioxide therapy became suicidally depressed following convulsive carbon dioxide treatment. The carbon dioxide therapy had been instituted as a last resort on a purely experimental basis before recommending lobotomies. Both of them were immediately and completely relieved of all depression on awakening from the anesthesia following their lobotomies. The results in these 2 patients substantiate a theory advanced in an earlier article *(3)* that one of the effects of electroshock on patients with a depression is a removal of inhibitory influences which emanate from the cortex and exert a dampening effect on thalamic or hypothalamic structures.

Two postlobotomy patients who became depressed several months after operation were relieved of their depression by a few stimulating subcoma carbon dioxide treatments.

CONCLUSIONS

The symptoms of nervous and mental illnesses are frequently relieved by the administration of carbon dioxide in subcoma, coma, or convulsive doses. Simple depressive mood disturbances seem to respond best to stimulating subcoma treatments. Psychosomatic illnesses with symptoms indicative of overactivity of the parasympathetic division of the autonomic nervous system likewise respond best to subcoma therapy. Psychosomatic illnesses with a form of anxiety and other symptoms indicative of overactivity of the sympathetic division of the autonomic nervous system respond best to coma therapy.

Obsessive-compulsive states, manic states, agitated depressions, and paranoid conditions are sometimes relieved by subconvulsive coma therapy but seem to respond best to convulsive therapy. The relief of simple depression by carbon dioxide therapy seems to be due to the stimulating effect of the gas mixture on central nervous system structures and endocrine glands which have to do with autonomic nervous system activity. Tension states seem to be relieved by a catharsis of pent-up psychic energy through somatic and autonomic channels. Subcoma carbon dioxide treatments seem to set off this catharsis. The work of Lorente de Nò *(8)* supports my conclusion that low concentrations of carbon dioxide increase the ability of nerve tissue to release energy.

Symptoms such as obsessions, compulsions, feelings of guilt and paranoid ideas, which may, allegorically at least, be thought of as resulting from reverberating circuits are possibly relieved by high concentrations of carbon dioxide through the ability of the gas to cause a cessation of the spontaneous rhythmic firing of impulses in nerve tissue *(8)*.

(8) Lorente de Nò, R.: Quoted by Meduna, L. J.: Carbon Dioxide Therapy: A Neurophysiological Treatment of Nervous Disorders. Charles C Thomas, Publisher, Springfield, Ill., 1950. pp. 15-16.

TEST OF CHRONIC TOXICITY OF IODINE AS RELATED TO THE PURIFICATION OF WATER[1]

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IODINE, made available in low and well-controlled concentrations by organic iodine-liberating compounds, is effective in the disinfection of drinking water. The purpose of this investigation was to determine whether prolonged use of drinking water containing small amounts of iodine is deleterious to health.

Troops in the field are normally supplied with potable water by: (1) engineer-operated water points using standard procedures, or (2) distillation of sea water. Regardless of the source, chlorination of water is at present the minimum acceptable treatment.

In the absence of a central source, small groups may purify water by: (1) adding purification tablets to water clarified by a standard 1/4 g. p. m. hand-operated, pad-type filter, or (2) chlorinating water in Lyster bags, ordinarily of 36-gallon capacity. A person may purify water in canteen quantities by means of the purification tablets alone. As a final recourse, water can be boiled 1 minute to destroy the pathogens, but this method is often impractical because of lack of fuel and security restrictions.

During World War II, tablets containing about 4 mg. of halazone per tablet were issued for individual use, and complete instructions were given as to the method of use. Although this method probably produced potable water in most instances, great concern arose as to the efficacy of the sterilizing agent in cold water, in water containing much organic material, and in water bearing such pathogens as amebic cysts. To study this problem, a contract was initiated in October 1942 between the Office of Scientific Research and Development and Harvard College to investigate the destruction of amebic cysts in drinking water with

(1) Project NM 005 045, Research Division, Bureau of Medicine and Surgery, Department of the Navy. The complete and detailed report of this project is on file in Research Division, Bureau of Medicine and Surgery, Department of the Navy, Washington, D. C. The authors are grateful to Captain L. B. Marshall, MC, USN, for condensing the report into its present form.

a special HTH-Na_2SO_3 bag devised by Colonel W. S. Stone, MC, USA. This contract expired in July 1943, but in view of the importance of the work to the Armed Forces the contract was extended and amplified not only to review, evaluate, and make recommendations for improvement of the work already completed, but also to devise new procedures for the effective disinfection of water in small quantities.

In the course of this further investigation, numerous water purification compounds submitted by various manufacturers were screened. It soon became evident that iodine-releasing compounds most nearly satisfied the requirements of the Armed Forces. Concurrently with these tests, the research group succeeded in developing a periodide which seemed more stable than other compounds. This periodide is tetraglycine hydroperiodide (formerly considered to be triglycine hydroperiodide). It resulted from reactions between elemental iodine, potassium iodide, glycine, and hydrochloric acid.

A tablet containing tetraglycine hydroperiodide, sodium acid phosphate, and a small amount of talc was compounded. The tablet weighed about 120 mg. and liberated 8 mg. of elemental iodine in 1 quart of water. Professor Gordon Fair *(2)* reported that in a pH range up to 7.5, dissociation into iodine is almost complete and the hydrolysis of iodine is not appreciable. Iodamines are not formed. The action of the elemental iodine probably accounts for its superior germicidal activity in the presence of organic materials. Fair further reported that experimental cysticidal times for 7.5 mg. of elemental iodine per liter are: 5 minutes at 23° C., 10 minutes at 10° C., and 20 minutes at 5° C., and that with this dosage and contact periods, *Escherichia coli, Eberthella typhosa, Shigella dysenteriae, Salmonella schottmülleri,* and *Vibrio comma* are reduced from 100,000,000 to 5 or less per hundred ml. of water. The cercariae of schistosomes are killed by a somewhat lower iodine content. *Leptospira icterohaemorrhagiae* succumbs at an even lower iodine content or in a shorter exposure time. The virus of infectious hepatitis has not yet been tested against iodine. Comparative results on the destruction of the virus of poliomyelitis by halazone and an iodine-releasing compound promise substantially parallel behavior of iodine in the destruction of viruses that have been killed by chlorine.

The course of the investigation now appeared to demonstrate that an iodine-releasing compound for individual water purifica-

(2) Fair, G. M.: Water disinfection and allied subjects. In Andrus, E. C.; Bronk, D. W.; Carden, G. A., Jr.; Keefer, C. S.; Lockwood, J. S.; Wearn, J. T.; and Winternitz, M. C. (editors): Advances in Military Medicine, Little, Brown & Co., Boston, Mass. 1948. Vol. II, chap. 34, pp. 520-531.

tion was available which would destroy amebic cysts, bacteria, and cercariae of schistosomes within 10 minutes in most waters, and within 20 minutes in cold water. It was suspected, however, that under climatic conditions of high temperature and humidity, the prolonged ingestion of iodine might cause the body to become more susceptible to fungus infection or to develop manifestations of chronic iodism. Therefore, tests were conducted using small groups of men under artificial tropical conditions in hot chambers. Although toxic symptoms did not appear in these test groups, it was considered that because of the limited number of subjects and short duration of exposure to iodine the results were inconclusive.

It was decided, prior to the standardization of the iodine tablet, to conduct an extended field test on a group of people in an area of constant high temperature and humidity where all the water consumed would contain iodine.

After many test sites were investigated, a naval installation at Uliga Island, Majuro Atoll (Marshall Islands), was selected. Basically, the test consisted of the introduction into the chlorinated water system of enough soluble iodine compound to yield iodine concentrations equivalent to, or in excess of, those used in the field purification process. This was continued over a period of 6 months, during which the test subjects were under continuous observation. Detailed control data were collected from Coast Guard personnel on nearby Ronguron Island, about 22 miles distant, who drank only chlorinated water. Tetraglycine hydroperiodide itself was not introduced into the water supply because of high costs and because its low solubility would not permit the desired concentration with conventional feeding equipment. Sodium iodide was finally selected as the most suitable of the available iodine compounds. The test was not concerned with the germicidal efficiency of iodine per se because disinfection was accomplished with chlorine. The principal objective was to discover possible toxic effects of iodine consumed over a period of several months under conditions of high temperature and humidity.

At the test site the water supply is obtained from rainfall collected in a shallow concrete catchment basin measuring 200 by 300 feet and 4 inches deep. Flowing into a sump, the water is chlorinated and then pumped either into the distribution system or into elevated and ground storage tanks. The consumption of fresh water varied from 7,500 to 10,000 gallons daily. Standard hypochlorinating pumps were installed on the discharge line from the pump station for the purpose of introducing sodium iodide into the water supply in measured quantities. The entire water system of the naval station was chlorinated and treated

with iodine during the 6-month period from 1 November 1949 to 30 April 1950. Detailed objective and subjective clinical data were obtained from a group of 24 station personnel. Examinations and tests were carried out to detect possible injurious effects such as stimulation or depression of the thyroid, cardiovascular damage, depression of bone marrow, renal irritation, sensitization to iodine, predisposition to diseases of the skin, and impaired wound healing. An effort was made to evaluate the acceptability of the water among those who consumed it.

The *results* of this study of subjects consuming iodated-chlorinated water over a period of months can be summarized as follows:

1. For the first 16 weeks of this study the average per man per day dose of iodine was estimated at 12 mg. During the last 10 weeks the iodine concentration in the water was increased to provide an average estimated dose of 19.2 mg. per man per day.

2. The unique taste of the iodine-treated water was at first objectionable to most of the personnel, but, after a period of exposure, only a few still found the taste offensive.

3. The average values derived from serial clinical tests over the 6-month period were compared with (a) conventionally accepted normal values, (b) average values from subjects consuming only chlorine-treated water, and (c) each other to detect any significant pathologic trends. Symptoms, signs, and laboratory findings indicative of disease were searched for in individual subjects.

4. Analysis of all of the data did not reveal evidence of weight loss, failure of vision, cardiovascular damage, altered thyroid activity, anemia, bone marrow depression, or renal irritation among the personnel consuming the iodated water.

5. In the opinion of the investigators, consumption of iodated water over the 6-month period did not result in an unusual incidence of any form of skin disease. There was no evidence of sensitization to iodine among the healthy station personnel under observation, nor was there any indication of impaired wound healing or defective resolution of infections as a result of the consumption of iodated water.

UNUSUAL COMPLICATIONS OF TROCAR CYSTOSTOMY

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JAMES C. KIMBROUGH, *Colonel, MC, USA (1)*

THE use of a trocar for suprapubic drainage of the bladder was described in 1914 by Lower *(2)* who considered it a safe and useful procedure. Many types of instrument have since been described but they all fall into two categories, namely, the trocar, and the trocoscope type which permits visualization of the bladder prior to insertion of the catheter. Duffy *(3)* has introduced a trocoscope which permitted visualization of the bladder before insertion of the suprapubic catheter.

A trocar cystostomy is indicated for relief of chronic urinary retention resulting from mechanical causes or from neurogenic factors. Dougherty *(4)*, however, described the trocar cystostomy as a routine aid for overcoming some of the postoperative difficulties encountered in transurethral resection of the prostate. Campbell *(5)* used trocar cystostomy on a 1-day-old infant and recommended the introduction of the instrument 2 cm. above the upper border of the pubis in a child, and about 4 cm. above in an adult.

Engel *(6)* reported on 400 patients on whom trocar cystostomy was used. In his series there were 9 deaths due to the procedure. The average age of the patients in his series was 75 years. Only 4 of the deaths were due to technical irregularities, such as a catheter being accidentally pulled out before an adequate sinus was formed. In 3 patients, perivesicular extravasation and infection resulted in death. Engel also reported that one of his associates inadvertently perforated the bowel of a patient who had had a previous combined abdominoperineal resection for

(1) Walter Reed Army Hospital, Washington, D. C.

(2) Lower, W. E.: Trocar and cannula for suprapubic drainage of bladder. Urol. & Cutan. Rev. 18: Jan. 1914.

(3) Duffy, J. J.: Duffy trocoscope. J. Urol. 43: 409-416, Feb. 1940.

(4) Dougherty, J. H.: Ordinary problems met with in electrosurgery of bladder neck and their solution. South. M. J. 44: 791-796, Sept. 1951.

(5) Campbell, M.: New fenestrated trocar for introduction of balloon catheters in cystostomy, nephrostomy and pyelostomy. J. Urol. 65: 160-162, Jan. 1951.

(6) Engel, W. J.: Suprapubic trocar cystostomy; an evaluation and presentation of an improved instrument. J. Urol. 65: 998-1005, June 1951.

rectal cancer, but there were no ill effects. This is always a potential danger when trocar cystostomy is performed. Engel quoted Ferrier as having performed bladder paracentesis on 50 cadavers after the bladder was distended to 500 cc., and in no case was the peritoneum touched. It is hardly necessary to point out that relaxation was perfect in these subjects. Austen *(7)* reported 32 trocar cystostomies and listed the following complications:

1. A perivesicular abscess on the tenth postoperative day.

2. A suspected bowel perforation for which an open cystostomy was performed. No perforation was found at the time of operation.

Trocar cystostomy has been carried out at this hospital on about 75 patients over a period of about 2½ years. The most common indication was neurogenic bladder. Several trocar cystostomies were performed because of acute obstruction, because the patient was considered a poor surgical risk, or for diversion of the urinary stream in gynecologic procedures such as the repair of a vesicovaginal fistula. Some of the patients had extensive abdominal injuries caused by gunshot wounds and in some colostomy drainage was present. In all of these patients cystostomy was accomplished without difficulty. Relaxation in the patients with a neurogenic bladder was excellent and in the others it was variable.

The following cases illustrate the possible dangers in performing a trocar cystostomy:

CASE REPORTS

Case 1. A 74-year-old man was admitted to the hospital on 10 August 1952 with acute urinary retention of 30 hours' duration. The patient had severe arteriosclerosis obliterans, diabetes mellitus, untreated carcinoma of the lip of 2 years' duration, an old myocardial infarction, and coronary insufficiency. Examination revealed the bladder extending up to the umbilicus. The prostate was enlarged, grade II, firm and smooth except for a hard mass 1 cm. in diameter in the left apex. The median sulcus was shallow and there was no fixation of the gland.

The patient's urine was loaded with white and red blood cells, and contained albumin (3 plus). The serum urea nitrogen was 29.4 mg. per 100 cc. and the urine culture was negative.

Immediate decompression of the bladder was begun and continued for several hours. On 16 August, after distending the bladder to 600 cc., a needle guide was inserted into the bladder at a point about 3 cm. superior to the symphysis pubis. The

(7) Austen, G. Jr.: Suprapubic trocar drainage of bladder. Am. J. Surg. 55: 509-515, Mar. 1942.

needle pierced the balloon of the Foley catheter which permitted the catheter to come out. There was a good flow of urine through the needle guide. The trocar was then introduced over the guide and a good flow of urine continued. Several hours after the procedure, the patient suffered a slight chill but had no other complaint. His temperature rose to 100.4° F.

Except for electrocardiographic changes compatible with coronary insufficiency, his condition was satisfactory on the day of operation but on 17 August he complained of abdominal pain. Some distention was present and there was an absence of bowel sounds. On a regimen of antibiotics, intravenous fluids, and abdominal decompression the patient improved. His urinary drainage was adequate. On 18 August his temperature was 98.2° F., and the urinary drainage contained shreds of mucus and débris. It was possible to irrigate until clear returns were obtained. The impression of a traumatic rupture of the bowel was confirmed by a cystoscopic examination which revealed the absence of the catheter in the bladder dome.

A cystogram disclosed an ileovesicular fistula. An immediate laporatomy was performed and an area of localized fibrinous peritonitis surrounding the traumatic rupture of the bowel was found. The perforations were closed and the suprapubic catheter left in place. The postoperative course was uneventful. The patient received radiation for carcinoma of the lip, but further surgical treatment was deferred because of his severe cardiac damage. He was sent home with a cystostomy drainage tube in place.

Case 2. A 71-year-old man was admitted to the hospital on 18 August 1952 with symptoms of prostatic obstruction which had been getting progressively worse for 2 years. Examination of the prostate disclosed a grade II enlargement, an irregular surface with stony hard nodules, and fixation of the gland. The residual urine measured 300 cc. There was 1 unit of acid phosphatase and 3.3 units of alkaline phosphatase. A phenolsulfonphthalein test revealed 40 percent excretion in an hour. The urine was loaded with pus cells and a culture revealed *Staphylococcus albus*. A roentgenographic survey was negative for metastases. A perineal punch biopsy confirmed the diagnosis of carcinoma of the prostate.

On 25 August a suprapubic trocar cystostomy, 4 cm. above the symphysis, was performed under local anesthesia. At that time it was noted that the patient was straining, but the bladder was readily palpable. Urine flowed freely through the trocar, indicating that it had been inserted over the needle guide into

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the bladder and there was a good flow of urine from the inserted catheter.

On the following day the patient complained of abdominal pain. Abdominal distention was present, there were no bowel sounds, and a small amount of green drainage had gathered around the catheter. A diagnosis of traumatic perforation of the bowel was made and a laporatomy performed immediately. A through-and-through perforation of a loop of the small bowel was found. The catheter was in place with its tip in the bladder. Repair was carried out and a suprapubic catheter left in place.

The postoperative course was uneventful. Transurethral resection of the prostate was performed on 1 October and castration on 9 October. The suprapubic cystostomy tube was removed on 11 October, and the wound healed satisfactorily. The patient's urinary stream was adequate and there was no residual urine. He was discharged on 15 October, and advised to take diethylstilbestrol.

COMMENTS

In case 1, there was no obvious factor to account for the perforation. The bladder was sufficiently distended and there was minimal straining during insertion of the needle guide. In case 2, the bladder had been collapsed for 7 days by a retention catheter and had been insufficiently distended during the trocar cystostomy. Another factor which may contribute to possible complications was the straining of the patient under local anesthesia and the resulting displacement of the small bowel toward the suprapubic region.

BOOKS RECEIVED

Back Down the Ridge, by *W. L. White.* 182 pages. Harcourt, Brace and Co., New York, N. Y., publishers, 1953. Price $3.

The 1952 Year Book of Orthopedics and Traumatic Surgery (November 1951-November 1952), edited by *Edward L. Compere,* M. D., F. A. C. S., Professor of Bone and Joint Surgery, Northwestern University Medical School; Chairman, Department of Orthopedic Surgery, Wesley Memorial Hospital; Consultant Orthopedic Surgeon, Chicago Memorial, Augustana and Henrotin Hospitals. 388 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., 1953. Price $6.

How to Improve Your Sight, Simple Daily Drills in Relaxation, by *Margaret Darst Corbett* (Authorized Instructor of the Bates Method). Revised edition. 93 pages; illustrated. Crown Publishers, Inc., New York, N. Y., publishers, 1953. Price $1.50.

THE RECOGNITION OF METASTASES

WILLIAM C. MATOUSEK, *Captain, MC, USA*

IT is interesting to compare the number of metastases recognized clinically with the number found at autopsy. Data relative to this point, covering 400 consecutive cases in which the primary cause of death was carcinoma, were obtained from the autopsy protocols of Walter Reed Army Hospital for the period from January 1940 to August 1948 (table 1).

Ten locations were favored by metastases. Each of numerous other sites was involved in less than 10 of the 400 cases. Metastases to the liver, lungs, bones, brain, and skin were usually recognized clinically. On the other hand, metastases to the kidneys, adrenals, pancreas, heart, and spleen were almost always unrecognized until the autopsy. It is therefore appropriate to ask whether more exhaustive studies will result in increased recognition of these metastases. Such recognition would seem to be particularly important to patients with metastases to the adrenals and the heart because specific therapy of these conditions may greatly improve the patient's lot.

Metastases to the adrenals. Of the 81 patients with metastasis to the adrenals, the metastases were secondary to carcinoma of the lung in 35. Eight of 55 testicular carcinomas, 7 of 23 pancreatic carcinomas, 6 of 41 gastric carcinomas, and 6 of 15 renal carcinomas metastasized to the adrenals. In none of these was adrenal metastasis suspected clinically. Classical signs and symptoms of Addison's disease may be evident, but they are usually erroneously attributed to terminal malignancy rather than to the adrenal metastases *(1)*. Although it is impractical to employ all of the endocrine, electrolyte, and carbohydrate tolerance studies available to establish a diagnosis of adrenal insufficiency in a patient with a known carcinoma, at least in a patient with bronchogenic carcinoma with metastasis, a 4-hour ACTH test should be made to evaluate adrenal function. If a diagnosis of adrenal insufficiency is made, the patient's condition may be greatly improved by treatment with DOCA and cortisone as well

(1) Butterly, J. M.; Fishman, L.; Seckler, J.; and Steinberg, H.: Addison's disease secondary to metastatic carcinoma of adrenal glands. Ann. Int. Med. 37: 930-939, Nov. 1952.

as electrolyte control. A patient with supposedly terminal cancer may thus be converted into an apparently healthy person for many weeks.

TABLE 1. *Clinical and pathologic incidence of metastases*

Site of metastasis	Number recognized	
	Clinically	At autopsy
Liver	112	175
Lungs	149	171
Bones	56	59
Brain	21	36
Skin	13	13
Kidneys	4	59
Adrenals	0	81
Pancreas	0	33
Heart	0	23
Spleen	0	22

Metastases to the heart. Of the 23 patients with metastasis to the heart, the metastases were secondary to bronchogenic carcinoma in 11; to renal carcinoma in 4; and to testicular carcinoma in 4. In none of these was cardiac metastasis suspected clinically. The physician is often not even aware of the cardiac tamponade caused by extensive metastatic growth in the pericardium or by pericardial effusion. Dyspnea and thoracic pain, particularly in a patient with bronchogenic carcinoma, should suggest this possibility. Pericardial involvement may be anticipated, before symptoms occur, by roentgenographic and electrocardiographic studies *(2)*. Much relief is afforded patients with cardiac tamponade by pericardial aspiration or deep roentgen-ray therapy—whichever seems more appropriate in the given patient.

(2) Friedberg, C. K.: Diseases of the Heart. W. B. Saunders Co., Philadelphia, Pa., 1949.

AMALGAM FAILURES

ROBERT P. MOSS, Jr., *Captain, DC, USA*

IT becomes evident to every dentist performing oral examinations that a large number of amalgam restorations placed in patient's teeth become faulty or fail to function properly. In routine examinations these may be classified as defective fillings or possibly new caries. The material used may have been unsatisfactory or the previous operator may not have followed the accepted principles of good operative procedures. After observing an alarming number of amalgam failures, it was decided that a determination should be made as to why they occurred. A number of causative factors were suggested and a plan was adopted to record the failures observed in routine dental examinations.

TABLE 1. *Types of failure and causative factors*

Type of failure	Total	Causative factor	Total
Recurrent caries	540	Faulty cavity preparation Failure of material	528 12
Fracture	355	Faulty cavity preparation Traumatic occlusion Faulty manipulation	310 28 17
Dimensional change	51	Expansion Contraction	39 12
Periodontal involvement	33	Lack of anatomic contour	33
Pulp	21	Lack of protective base	21
Total	1,000		1,000

A chart (summarized in table 1) listing the common causative factors, with a space for additional comments by the examiner, was made. The patients were Army personnel predominantly in the age group of 19 through 27 years and examinations were made by Army dental officers. No record was made of the age of the restoration. When a failure was observed, one clear-cut or definite causative factor was selected as the reason and re-

corded as such. If several factors were apparently contributing to the failure with none predominating, the case was not recorded. The series was arbitrarily limited to 1,000. From this study, it became clear that incorrect cavity preparation was the causative factor of 83.8 percent of the amalgam failures recorded. Fractures *can* be due to a material failure, but none were so recorded in this series.

TABLE 2. *Frequency of violations of fundamental principles of amalgam cavity preparations*

Violations	Total	Type	Total
No extension for prevention	700	Occlusal fissures Proximal flares Class 5 extension (Black)	297 286 117
Insufficient provision for bulk	197	At isthmus Cavity depth Occlusal fissures	93 58 46
Inadequate preparation of cavosurface margin	69		69
Inadequate retentive form	34		34
Total	1,000		1,000

Another chart (summarized in table 2) was made for the study of those amalgam failures due to cavity preparation. This was also carried out in the same manner on another series of 1,000. This study clearly shows that the principle of extension for prevention is not being properly adhered to by the dental operator.

CONCLUSION

Most amalgam failures are due to shortcomings of the operator, not the material. Too little time is spent in preparing a cavity suitable for receiving and retaining an amalgam. A greater effort should be made by most operators to become familiar with the management, manipulation, and preparation for amalgam restorations.

THE EHLERS-DANLOS SYNDROME

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MORRIS M. MEISTER, *First Lieutenant, USAF (MC)*

THE Ehlers-Danlos syndrome is an unusual condition well known to dermatologists and pediatricians. When fully developed, the diagnosis is clear-cut, but many mild forms of this condition are overlooked. Although first described by Ehlers *(1)* in 1901, the first report in the American literature *(2)* appeared 33 years later. The cause is unknown but the hereditary aspects have been clarified by Johnson and Falls *(3)*. It appears that the condition is transmitted as a Mendelian dominant trait. This disorder is characterized by: (1) hyperextensibility and hyperlaxity of the joints, (2) hyperelasticity and hyperlaxity of the skin, and (3) friability and fragility of the skin with scar formation and hemorrhagic manifestations following minor trauma. Profuse hemorrhage following minor surgical procedures has been reported *(3)* even though the bleeding time was normal. Pseudotumors and subcutaneous nodules have been described as either subcutaneous fat *(4)* or true fibromas *(5)*.

The following case report is presented primarily because of the unusual hemorrhagic manifestations.

CASE REPORT

A 32-year-old married woman (gravida III, para II) gave a history of "spotting" with 2 previous pregnancies, but both had progressed to term and with normal labors. There were no postpartum complications. Her last menstrual period began on 7 April 1951. The expected date of confinement was 12 January 1952.

The patient appeared older than her stated age. Her features were coarse, and her cheek bones high and prominent. Her skin had a velvety feel and over the nape of her neck was thickened

(1) Ehlers, E.: Cutis Laxa, Neigangzu Haemorrhagien in der Haut, Lockerung Mehrer Articulationen. Dermat. Ztschr. 8: 173, 1901.

(2) Tobias, N.: Danlos syndrome associated with congenital lipomatosis. Arch. Dermat. & Syph. 30: 540-551, Oct. 1934.

(3) Johnson, S. A. M., and Falls, H. F.: Ehlers-Danlos syndrome; clinical and genetic study. Arch. Dermat. & Syph. 60: 82-105, July 1949.

(4) Weber, F. P., and Aitken, J. K.: Nature of subcutaneous spherules in some cases of Ehlers-Danlos syndrome. Lancet 1: 198-199, Jan. 22, 1938.

(5) Ronchese, F.: Dermatorrhexis, with dermatochalasis and arthrochalasis (so-called Ehlers-Danlos syndrome). Am. J. Dis. Child. 51: 1403-1414, June 1936.

and furrowed. Her uterus was enlarged to the size of a 3-month gestation. The blood was group O, Rh_0 positive, with 4,330,000 erythrocytes and a hemoglobin of 13.5 grams. Iron, calcium, and vitamins were prescribed.

The prenatal course was uneventful until the seventh month of pregnancy when scattered petechias on the upper extremities were noted by the patient. At that time the Rumpel-Leede phenomenon was markedly positive; bleeding time was 4 minutes; coagulation time (capillary tube method), 2 minutes; platelet count, 346,000; and prothrombin time, 100 percent. Twenty mg. of rutin and 100 mg. of ascorbic acid were given daily by mouth, but the petechias continued to appear throughout the remainder of the pregnancy.

On 14 January 1952, an apparently normal, living infant was delivered spontaneously after 4 hours of labor. The placenta was circumvallate in type and contained several moderate-sized healed infarcts. Blood loss during delivery was estimated at 100 cc. During an uneventful postpartum course, she was given intramuscularly 25 mg. of testosterone proprionate daily for 5 days and 0.2 mg. of ergonovine maleate by mouth t. i. d. for 4 days. Postpartum vaginal bleeding was not excessive, and blood studies on discharge showed a hemoglobin of 13 grams with 4,100,000 erythrocytes.

On 18 February the patient reported for a postpartum check complaining of vaginal bleeding since discharge from the hospital. On examination the uterus was 2½ times normal size and was bleeding excessively. Dilation and curettage was performed 3 days later in the belief that some retained placental tissue was the cause of the bleeding. The pathologic report disclosed only a moderate amount of secretory endometrium. She was discharged from the hospital on 25 February with minimal vaginal bleeding. She returned 1 month later complaining of continued vaginal bleeding. Her uterus was of normal size but blood was oozing from the cervix. She was readmitted and on questioning it was learned that she had had recent, mild epistaxis on forcefully blowing her nose, occasional rectal bleeding on bowel movement since she was 18 years old, excessive bleeding following tonsillectomy at the age of 14 years, and that for many years she had bruised easily. "Double-jointedness," especially involving her fingers and hip joints, had been present since early childhood. Joint subluxation was not sufficient to impair normal activity. Traction on the skin over her cheek bones, knees, and elbows produced a mild tenting effect (fig. 1). On release of the tension, the skin returned to its normal position. On this admission her bleeding time was 4 minutes; coagulation time (Lee-White), 5-7½-8 minutes; platelet count, 260,000; clot retraction,

normal; prothrombin time, 100 percent; urine and stool, negative for blood; bone marrow examination, mild erythroid hyperplasis; 17-ketosteroids, 18 mg. per 24 hours (normal 10-29); and Thorn test, normal.

Figure 1. Photograph showing the hyperlaxity of the skin.

A tentative diagnosis of Ehlers-Danlos syndrome was made. This was supported by the findings of atrophy of the epidermis with blunting of the rete pegs, increase and fragmentation of elastic tissue, and basophilic degeneration of the collagen in the upper corium (fig. 2). We were unable to follow the patient beyond this point because of her return to the United States.

DISCUSSION

Although the Ehlers-Danlos syndrome has been described as primarily a skin disease, this case illustrates that altered capillary fragility and resultant hemorrhagic manifestations may accompany it (as would be expected of a disorder classified as a constitutional mesenchymal dyscrasia) *(6)*. Tissue studies of organs have not been made, but Ormsby and Tobin *(7)* have assumed that the elastic tissue disturbances may not be limited to the skin. The increase in defective elastic tissue along with a diminution in collagen may be primarily responsible for the increased capillary fragility. That the elastic fibers play an important role in capillary fragility has been demonstrated in histologic study of petechias produced in normal persons by negative pressure technics. Fragmentation of the elastic tissue ele-

(6) Benjamin, B. (Montreal), and Weiner, H.: Syndrome of cutaneous fragility and hyperelasticity and articular hyperlaxity. Am. J. Dis. Child. 65: 247-257, Feb. 1943.

(7) Ormsby, O. S., and Tobin, W. W.: Cutis hyperelastica; case report. Arch. Dermat. & Syph. 38: 828-829, 1938.

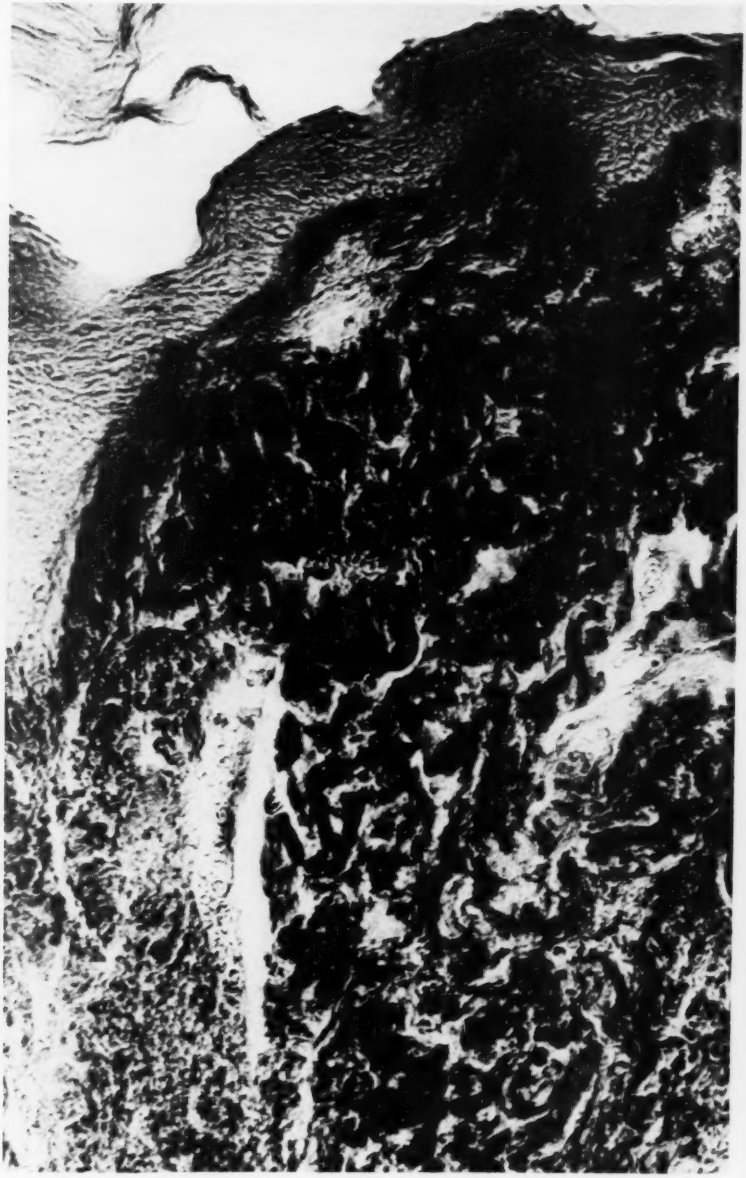
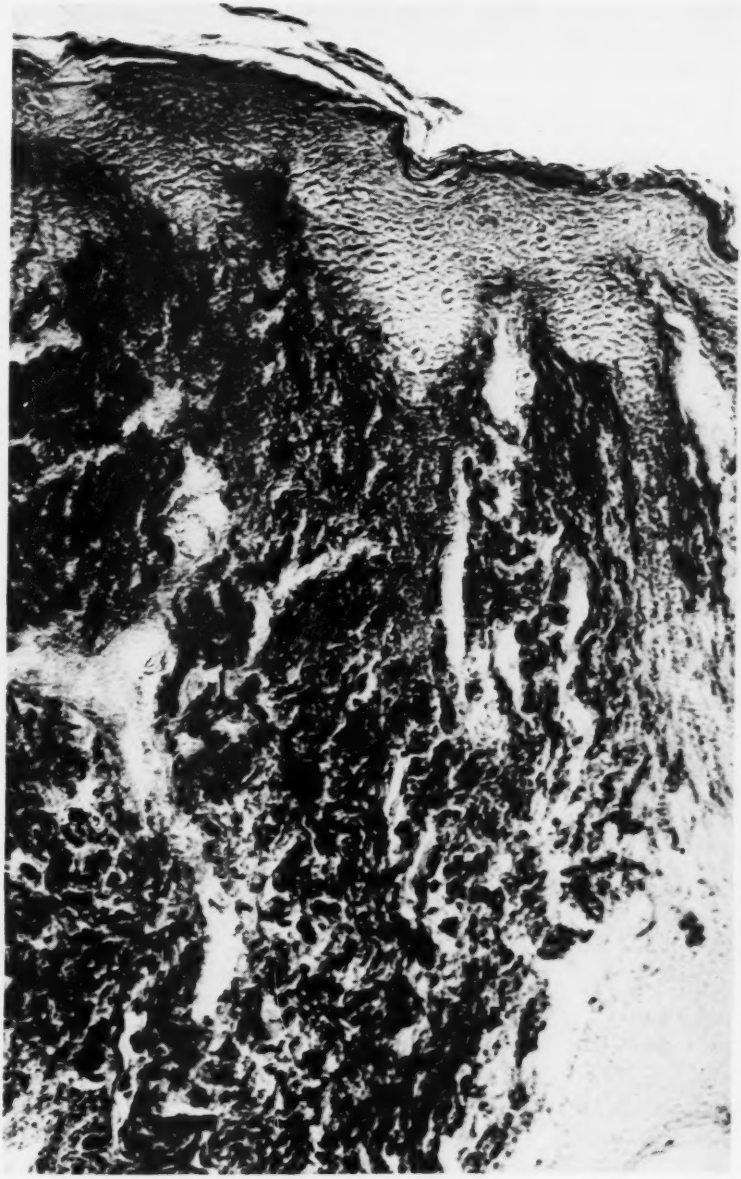


Figure 2. Photomicrograph showing atrophy of the epidermis with blunting



of the rete pegs and the increase and fragmentation of elastic tissue. X 126.

ments in the skin contiguous to the hemorrhage has occurred with no damage to the endothelium *(8)*, the erythrocytes escaping by diapedesis. Hyperelasticity and fragility of the skin have been thought to be due more to the qualitative changes in collagen *(9)* than to quantitative changes in elastic tissue.

The normal bleeding time in this syndrome is explained by the retraction of the wound edges, due to the increased elastic tissue, which results in compression of the capillaries. Hemorrhagic manifestations, if they occur, are thus not usually severe. The spontaneous occurrence of petechias during the seventh month of pregnancy is an unusual manifestation and may have been related to the expanded blood volume which reaches a maximum at this time.

Differential diagnosis should include pseudohemophilia, hereditary familial purpura, and hereditary hemorrhagic telangiectasia. There is no specific treatment for this syndrome other than prompt recognition and prevention of undue trauma. Wounds should be promptly sutured and compression applied to hematomas in order to minimize the exaggerated tendency for scar formation with deformity *(7)*. Orthopedic appliances and operations *(10)* may be necessary in the treatment of extreme articular hyperlaxity.

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(8) Hare, F. W., Jr., and Miller, A. J.: Capillary resistance tests. Arch. Dermat. & Syph. 64: 449-463, Oct. 1951.

(9) Gadrat, J., and Bazex, A.: Sur le syndrome d'Ehlers-Danlos. Ann. de Dermat. et Syph. 78: 430-444, July-Aug. 1951.

(10) Taylor, F. R.: Meekrin-Ehlers-Danlos syndrome. Urol. & Cutan. Rev. 47: 378-379, June 1943.

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REPLACEMENT LIPOMATOSIS RESEMBLING RENAL TUMOR

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THE following case is reported because of the difficulty encountered in distinguishing renal lipomatosis from a renal tumor, both grossly and microscopically, following renal resection for infected multilocular cysts.

CASE REPORT

A 22-year-old Marine was admitted to another hospital on 12 May 1952 because of a dull ache in the left flank and back and urinary frequency and burning. There was tenderness in his left costovertebral angle, pyuria, and albuminuria. He was given penicillin for 7 days with symptomatic relief. Intravenous urography was not done because of feared sensitivity to contrast medium. Cystoscopic studies were incomplete because of obstruction encountered by ureteral catheters bilaterally resulting in unsatisfactory pyelograms. On 23 May he was transferred to this hospital with the sole complaint of a dull ache in the left costovertebral angle. Many leukocytes were seen in the centrifuged urinary sediment. Urine concentration and dilution tests were within normal limits.

A roentgenogram of the urinary tract revealed a large mass in the lower left renal region. Both intravenous and retrograde pyelograms revealed distortion of the left renal collecting system, apparently caused by pressure from a cystlike mass in the lower portion of the left kidney. Hydro-ureter was seen on the left. These findings were interpreted as cyst or tumor of the left kidney. The right renal shadow was slightly smaller than normal and there was an irregular deformity of the collecting system such as is seen in a developmental anomaly (figs. 1 and 2). The right ureteropelvic junction was narrowed, just admitting a No. 4 French ureteral catheter. Function tests of both kidneys, using intravenous pyelography and indigo-carmine excretion, were normal.

Surgical exposure of the left kidney revealed a large cystic lower pole from which about 100 cc. of clear, yellow fluid was

(1) U. S. Naval Hospital, Charleston, S. C., at time of writing; now at U. S. Naval Hospital, Philadelphia, Pa.

Figure 1. Retrograde pyelogram showing distortion in left renal pelvis caused by a cystic lower pole. Figure 2. Retrograde pyelogram showing cyst of left kidney with distortion of right renal pelvis.

aspirated by needle. Directly under the first cyst wall was another, from which about 200 cc. of thin, white pus was aspirated. When these 2 cysts were collapsed, a third, smaller than the first 2, was seen near the hilar portion. Aspiration again produced a thin, white pus. This multilocular, infected, cystic mass was resected from the main body of the kidney, which on inspection appeared to be smooth, normal renal parenchyma. In the cyst wall near the renal hilum was seen a round, yellow-white, solid tumor, measuring about 3 cm. in diameter and grossly resembling a renal carcinoma. Nephrectomy was not carried out because of the doubtful status of the right kidney.

The pathologist reported multilocular cysts of the lower pole of the left kidney. Vascular granulation tissue lined the cyst walls. The outer wall was composed of compressed atrophic renal parenchyma in which microscopic cystic tubules, atrophic cellular glomeruli with wide glomerular spaces, thickened arteries, bundles of smooth muscle, collections of lymphocytes, and a diffuse scattering of lymphocytes, eosinophils, and polymorphonucleocytes were seen. Focal collections of polymorphonucleocytes and micro-abscesses were noted perivascularly. Lymph follicles with active centers showing phagocytosis were seen. Sections through the opaque, yellow tumor and the large cyst wall showed compression of the kidney parenchyma to form a pseudocapsule that was heavily infiltrated by lymphocytes, plasma cells, and eosinophils. This pseudocapsule was edematous and vascular, and merging into it were nests of clear cells sometimes arranged in strands, showing a clear, foamy, granular to vacuolated cytoplasm around a central nucleus. The cells were polyhedral and uniform. Many areas of necrosis and hemorrhage were present. Clear cells were arranged in cords on thin fibrovascular strands merging into adjacent compressed atrophic renal parenchyma.

No growth from the pus obtained at operation was observed on blood agar or MacConkey's medium. The patient had had penicillin prior to hospitalization.

DISCUSSION

The diagnosis of left renal malignancy (clear cell carcinoma) led to a consideration of total removal of the left kidney. This was not done immediately because of the questionable health of the right kidney. The function of the right kidney appeared adequate as a result of tests, but the distortion of the collecting system with narrowing of the ureteropelvic junction in addition to apparent shrinking of the renal outline prompted resection instead of total nephrectomy. Review of the tissue sections, after the diagnosis of clear cell carcinoma was made, led to revision of the original diagnosis.

The lesion was found to represent an accumulation of fat-containing macrophages rather than a clear cell carcinoma. Fat stains aided in identifying fat globules and differentiating between carcinomatous clear cells and replacement lipomatosis. The lesion was aptly described as a lipoid granuloma. This is a pseudotumor, not to be confused with the rare renal lipoma (2). Its gross resemblance to a tumor is most unusual, although preoperative pyelograms have erroneously led to a diagnosis of tumor in other patients (3). Renal infection, hemorrhage, and atrophy are the usual precursors to this condition (4). All of these were present in this patient in whom infected multilocular cysts represented the underlying lesion. Obesity and calculus formation in the kidney frequently accompany this condition (5), but neither was present in this patient.

(2) Robertson, T. D., and Hand, J. R.: Primary intrarenal lipoma of surgical significance. J. Urol. 46: 458-474, Sept. 1941..

(3) Simril, W. A., and Rose, D. K.: Replacement lipomatosis and its simulation of renal tumors; report of 2 cases. J. Urol. 63: 588-592, Apr. 1950.

(4) Frumkin, J.: Replacement lipomatosis of kidney. J. Urol. 58: 100-105, Aug. 1947.

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On Burns, compiled and edited by *Nathan A. Womack,* M. D. Participants: Dr. *William Altemeier,* Dr. *James Barrett Brown,* Dr. *W. J. H. Butterfield,* Dr. *Truman Blocker,* Dr. *Julian Bruner,* Dr. *Stuart Cullen,* Dr. *Sam May,* Dr. *Carl Moyer,* and Dr. *Sidney Ziffren.* American Lecture Series, Publication Number 165, A Monograph in the Bannerstone Division of American Lectures in Surgery, edited by *Michael E. DeBakey,* M. D., Professor of Surgery and Chairman of the Department of Surgery, Baylor University College of Medicine, Houston, Tex., and *R. Glen Spurling,* M. D., Clinical Professor of Surgery, University of Louisville, Louisville, Ky. Plastic Surgery Division. Editor, *James Barrett Brown,* M. D., Professor of Clinical Surgery, School of Medicine; Professor of Maxillo-Facial Surgery, School of Dentistry, Washington University, St. Louis, Mo.; Director, Division of Plastic Surgery, Veterans Administration, Washington, D. C. 178 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1953. Price $5.50.

SPONTANEOUS RUPTURE OF AN UMBILICAL HERNIA

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ROBERT B. BROWN, *Captain, MC, USN (1)*

THE following is a case presentation of an unusual complication of an umbilical hernia which was observed in a patient with Laennec's cirrhosis. An umbilical hernia is not infrequently found in patients who have cirrhosis with ascites. Altschule *(2)* reported 4 such patients in whom the presence of the hernia led to medical consultation. On the other hand rupture of an umbilical hernia is far from common. Iason *(3)* stated that rupture of an umbilical hernia is a rare complication, but did not refer to any specific cases. In 1901, Johnson *(4)* reported a 57-year-old female patient with rupture of an umbilical hernia who succumbed 7 days postoperatively from what was thought to be generalized peritonitis. He briefly reviewed 17 case reports of similar occurrences. McGrath *(5)* reported a patient who had rupture of an umbilical hernia with operative repair and who made an uneventful recovery. A review of the literature since 1918 has failed to disclose a single case of rupture of an umbilical hernia.

CASE REPORT

A 56-year-old man was admitted to this hospital on 25 September 1952 complaining of diarrhea and abdominal swelling. He had been admitted to this hospital many times previously for management of a Laennec's cirrhosis with ascites. His treatment on these admissions consisted of bed rest, a salt-poor diet, intravenous infusions of salt-free serum albumin, and paracenteses. An umbilical hernia which was noted on all of these admissions, allegedly had been kept reduced by elastic bandaging. About 4 days prior to admission the patient noted severe abdominal cramps associated with the passage of 8 or 10 black, watery stools per day. This lasted for 3 days, then the color

(1) U. S. Naval Hospital, National Naval Medical Center, Bethesda, Md.

(2) Altschule, M. D.: Hernia as presenting complaint in patients with cirrhosis of liver and ascites. New England J. Med. 224: 351-352, Feb. 27, 1941.

(3) Iason, A. H.: Hernia. Blakiston Co., Philadelphia, Pa., 1941. p. 858.

(4) Johnson, J. L.: Ruptured umbilical hernia. Tr. South. S. A. 14: 257, 1901.

(5) McGrath, W. J.: Unusual case of umbilical hernia; rupture of skin. J. A. M. A. 71: 1650, Nov. 16, 1918.

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of the stools changed to yellow but they remained watery and mixed with mucus. Tenesmus and cramping continued. There was no anorexia, nausea, or vomiting.

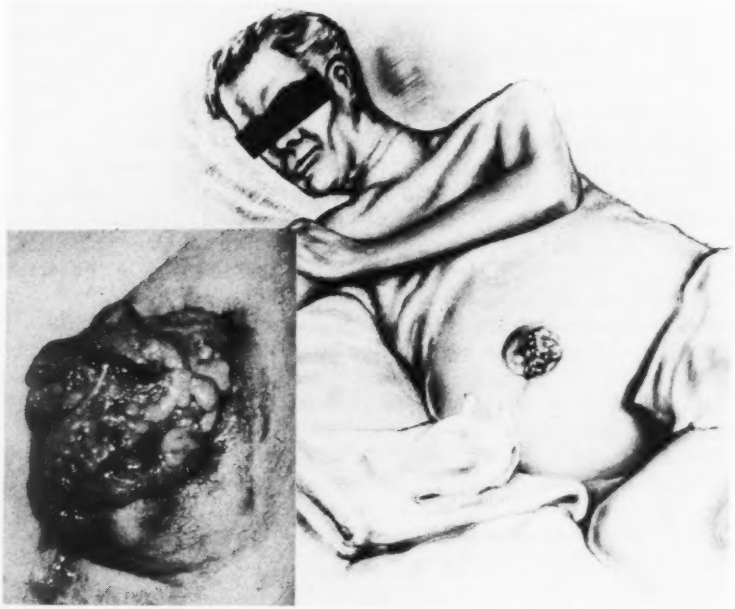


Figure 1. Reproduction made from a photograph taken shortly after the rupture of the umbilical hernia. The insert is a photograph of the area of rupture showing the necrotic skin and eviscerated omentum.

On admission the patient was emaciated, dehydrated, and appeared 20 years older than his stated age. His abdomen was markedly distended and exhibited a definite fluid wave when percussed. No intra-abdominal viscera or masses could be palpated because of the ascites. An umbilical hernia was present. The skin over the hernia was dark in color, but not gangrenous. There were several well healed scars in both lower abdominal quadrants indicative of previous paracenteses. Rectal examination revealed moderate prolapse of internal hemorrhoids. There was no evidence of fresh or old blood on the examining finger. There was a 1-plus pretibial pitting edema. The white blood cell count was 11,050 with 65 percent polymorphonucleocytes, 27 percent lymphocytes, 5 percent band forms, and 3 percent eosinophils. The red blood cell count was 2,270,000 with 8.6 grams of hemoglobin per 100 ml. The total protein was 6 grams with a 1:1 albumin-globulin ratio. The serum sodium

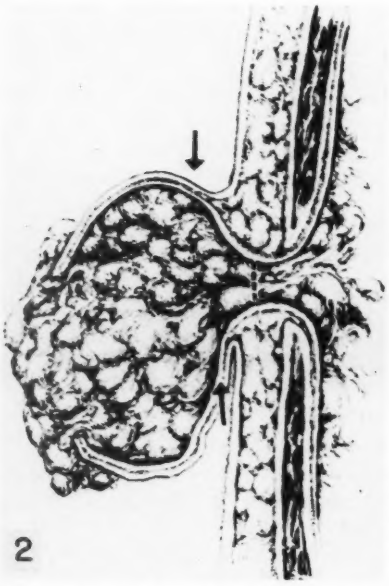
was 300 mg. per 100 ml. The blood volume was within normal limits.

The patient was treated symptomatically for his diarrhea which subsided on the third day after admission. During this time he also received 1,500 cc. of whole blood. His red blood cell count was raised to 3,500,000 and his hemoglobin to 10.5 grams per 100 ml.

On the night of 20 October the patient, tiring of his umbilical hernia support, removed the elastic binder and arose from his bed to walk to the bathroom, whereupon the umbilical hernia ruptured spontaneously, and there was a sudden profuse eruption of ascitic fluid. The loss was estimated to be between 3 and 4 liters. Together with this tremendous loss of fluid, there was an evisceration of omentum. When examined shortly after this occurrence the patient was lying quietly in bed, not in shock, and not in any particular distress. His abdomen was flat and flaccid. In the center of the abdomen there was an omental tag measuring about 8 by 6 by 2 cm. surrounded by the necrotic, thin, ruptured skin of the umbilical hernia. The generally debilitated state of the patient and the character of the ruptured hernia is illustrated in figure 1.

The patient was taken to the operating room where, under local anesthesia, the ruptured sac was explored. Although examination of the omental tag revealed no evidence of impairment of circulation, the neck of the hernial sac was constricted and measured only 1.5 cm. in diameter. The base of the herniated omental tag was firmly adherent to the neck of the sac by dense scar tissue, making it apparent that the omental tag had resided in the hernial sac for an appreciable time. An attempt was made to replace the omentum in the abdominal cavity, but because of the dense scarring, adhesions, and tendency of the tissues to bleed on handling, it was decided to excise the omentum which had herniated through the neck of the sac. This was doubly ligated with No. 00 chromic catgut flush with the anterior rectus sheath and amputated as illustrated in figure 2. Following this maneuver, 200,000 units of aqueous penicillin G and 0.5 gram of streptomycin mixed in 10 cc. of sterile water were instilled into the peritoneal cavity. The rectus sheath was then imbricated over the hernial defect and omental stump using eight 0.009-inch stainless steel wire vertical mattress sutures placed longitudinally along the linea alba in the manner indicated in figure 3. Having repaired the hernia in that fashion, the excess, redundant, and necrotic skin was excised and a primary closure was made over a small soft rubber drain. A sterile dry dressing was applied using a scultetus binder reinforced with adhesive tape.

The patient had an uneventful and uncomplicated postoperative course insofar as his hernial repair was concerned. On 30 December he succumbed, however, to the systemic disease which led to his admission.



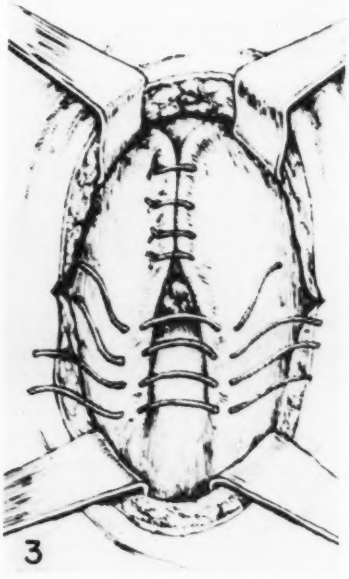


Figure 2. The dotted line indicates the line of amputation of the omental tag. The arrows point to the line of excision of necrotic skin covering the hernia. Figure 3. Eight stainless steel wire sutures were used to imbricate the rectus sheath over the hernial defect.

DISCUSSION

It is interesting to speculate on the probable causes of gangrene and necrosis of the skin and eventual rupture of this hernia. These might have been (1) pressure from without caused by the abdominal binder, (2) tremendous pressure from within due to the ascitic fluid, (3) venous congestion (caput medusae), (4) malnutrition, and (5) sudden increase in pressure on the unsupported abdominal wall exerted when the patient arose from a recumbent to a standing position.

MANAGEMENT OF TRAUMATIC CYSTS OF THE MANDIBLE

SOL L. ORLEAN, *Major, DC, USAR*

ARNOLD GOTTLIEB, *Captain, DC, USAR*

TRAUMA about the mouth is often neglected at the onset because of the absence of acute subjective symptoms, and the patient may eschew treatment except for the immediate relief of pain. When a blow is received on the mandible, bone trabeculas may be crushed and hemorrhage may ensue. This reaction results in a hematoma and proteolysis which forms a cavity without a definite lining but containing blood, débris, and connective tissue. At the onset, the lesion is noncystic in nature although called a traumatic or an extravasation cyst. These lesions may occur at the apexes of the lower anterior teeth under excessive occlusal trauma. We shall describe the treatment given to 2 patients with traumatic cysts caused by a blow on the mandible in the region of the anterior teeth. In both patients, the teeth directly affected by the blow received no consideration. Neither periodic radiographs nor vitality tests were made. The importance of periodic posttraumatic examinations after injuries about the face cannot be over-emphasized.

CASE REPORTS

Case 1. A 22-year-old man complained of pain in and about the lower anterior teeth. He had received a blow in this area about 2 years earlier, at which time there were slight, superficial contusions and abrasions. For several weeks following the injury he had a dull sensation about the lower anterior teeth. There was no acute pain. Clinical examination revealed no cause for his pain. Percussion tests were negative. The painful teeth had no fillings. There was normal incisal abrasion for his age. His occlusion was good and, in general, his mouth was clean and healthy. There was no evidence of gingival or mucoperiosteal swelling. Vitality tests revealed that his left lateral incisor was nonvital and his left central and right central incisors had diminished vitality.

A roentgenogram (fig. 1) showed a large traumatic cyst involving both central incisors and the left lateral incisor. The most severe degeneration appeared around and below the left lateral incisor. In view of the healthy state of the patient, it was

Figure 4.

Figure 3.

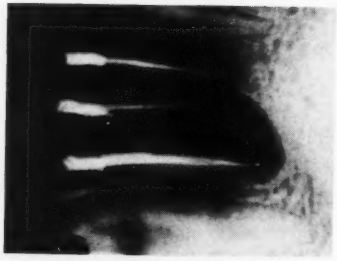


Figure 2.

Figure 1.

decided to attempt an all inclusive treatment in one visit to maintain the teeth while eliminating the cyst and to include root canal therapy to the 3 teeth.

The use of a potent and prolonged anesthetic was necessitated by the extensiveness of the lesion and the lengthy treatment. The anesthetic of choice was lidocaine with 1:50,000 epinephrine. Right and left inferior alveolar injections were given along with infiltration in the area of the labial frenum to anesthetize the interstitial nerve fibers.

The 3 teeth were isolated and lingual openings were made directly into the pulp chambers, giving ready access to the canals. There was an immediate release of thick pus from the left lateral incisor. The left central incisor was partially necrotic and the pulp was readily removed. Pressure anesthesia with a procaine pellet was required to facilitate the painless extirpation of the pulp of the right central incisor. After properly reaming and filing all 3 canals, they were washed of their debris with 3 percent hydrogen peroxide administered in a Luer-Lok syringe and then rinsed again with chloramine-T solution. The left lateral incisor was aspirated by means of the insertion into the canal of a hypodermic needle attached to an aspirator tube. After drying the canals thoroughly with sterile, absorbent points, gutta-percha points were measured to fit into the apexes and then x-rayed to confirm their position. The canals were then carefully filled with gutta-percha and chloropercha. Additional roentgenograms were taken (fig. 2) to insure an exact fit at the apexes. Finally, the lingual openings were based with cement and filled with amalgam.

The anatomy of this mandible was somewhat anomalous, in that it had a heavy, bulbous gingival layer of alveolar bone and a deep concavity in the bone in its approach to the inferior border of the mandible, indicating a lingual version of the roots. This, in effect, guided the modus operandi.

A large, convex, semilunar, mucoperiosteal flap was made from the distal surface of the right lateral incisor to the distal surface of the left cuspid, exposing the alveolar plate overlying the cystic area. A window was made through the bony plate by first using a chisel and then enlarging the opening with bone rongeurs. This process was continued until sound bone was reached, and the window was large enough to permit proper enucleation of the cyst. The cyst was shelled out with a large-bowled curet. The cystic fluid was yellow and serous. The alveolar process was smoothed. The cavity was irrigated with normal saline solution and carefully examined. Care must be taken to eliminate the entire epithelium because any remnants could proliferate and

produce a residual cyst. A cross-cut fissure bur was used to remove the apical third of the devitalized teeth. The root ends were rounded and the gutta-percha canal fillings were smoothed by the application of a heated instrument. Gelfoam was placed in the cavity and the flap was sutured in position. The patient was given codeine sulfate tablets for postoperative relief of pain, and was x-rayed (fig. 3) to check the entire operative area. An intramuscular injection of 600,000 units of procaine penicillin was administered.

Healing was uneventful. One month after the operation the incised area had returned to a normal, healthy condition. A roentgenogram taken at that time (fig. 4) revealed filling in of the bone in this area. The teeth adjacent to the operative area had retained normal vitality.

Figure 5.

Figure 6.

Case 2. A 21-year-old man complained of pain in the lower anterior teeth. He had received a blow to this region about 9 months earlier, at which time he had noted a sensitivity on occluding the teeth. This discomfort was short-lived and dental treatment was not sought. Clinical examination revealed a mucoperiosteal swelling in the region of the lower central incisors. The teeth were tender to percussion. Normal incisal abrasion was present. The teeth were not discolored. The occlusion was good and an otherwise healthy oral condition prevailed. Vitality tests revealed that both central incisors were nonvital, but the left lateral incisor and the right lateral incisor reacted normally.

A roentgenogram (fig. 5) showed a large traumatic cyst located directly below the central incisors. It was decided to attempt an all inclusive treatment such as was applied in case 1. The patient was given an intramuscular injection of 300,000 units of procaine penicillin because of the cellulitis, and was advised to return in 24 hours, at which time right and left inferior alveolar injections were given and the area of the labial frenum was infiltrated to

anesthetize the interstitial fibers. The central incisors were isolated and lingual openings made. Thick pus was aspirated from both canals. The procedure of reaming and filing, washing and sterilizing, and finally drying the canals was accomplished. The canals were measured for gutta-percha points, x-rayed, and subsequently filled carefully. After properly filling the lingual openings, the patient was prepared for the next stage.

Because of the mucoperiosteal swelling and the normal anatomy of the mandible, it was decided that a flap type of incision was indicated. A 45° incision was made from the gingivodistal margin of the left lateral incisor down to the mucolabial fold. This was carried labially around the necks of the teeth to the gingivodistal margin of the right lateral incisor and then continued diagonally downward to the mucolabial fold. The mucoperiosteum was reflected with a periosteal elevator which completely exposed the overlying osseous structure. The osteolytic action of the cyst had caused a complete breakdown of the alveolar bone in the area, clearly exposing the site of infection. Bone rongeurs were used to enlarge the openings until sound bone was reached. The cyst was enucleated from its bony crypt. It extended lingually to the posterior surface of the mandible. The cavity was irrigated and examined carefully. This cyst contained a thick caseinlike substance, within its epithelial sac. The apexes of the involved teeth were cut and rounded; the gutta-percha fillings smoothed; and after placing a gelfoam packing in the cavity, the flap was sutured in position. An intramuscular injection of 600,000 units of procaine penicillin was given.

Healing was uneventful. One month after the operation the vitality of the right and left lateral incisors was only slightly lower than on the initial test; the incised area had returned to normal; and a roentgenogram (fig. 6) showed filling in of bone in this area.

CONCLUSION

The procedure described can be successfully applied to many patients who have a similar type of cyst, thereby saving the affected teeth. Postoperative vitality tests and roentgenograms should be taken after 1-, 3-, 6-, and 12-month intervals until the area has completely healed.

BOOK REVIEW

Electrocardiography in Practice, by *Ashton Graybiel,* Captain, MC, USN; Director of Research, United States Naval School of Aviation Medicine, Pensacola, Fla.; *Paul D. White,* M. D., Executive Director, National Advisory Heart Council; Consultant in Medicine, Massachusetts General Hospital; *Louise Wheeler,* A. M., Executive Secretary, the Cardiac Laboratory, Massachusetts General Hospital; and *Conger Williams,* M. D., Instructor in Medicine, Harvard Medical School; Associate Physician, Massachusetts General Hospital. 3d edition. 378 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1952.

This new edition is completely rewritten. Since the second edition, electrocardiography has continued to develop toward better-defined concepts concerning the electrical activity in the muscle unit and the interpretation of this electrical activity as recorded by the newer instruments. The first 3 parts of this book give an excellent review of the present concepts of the origin and progression of the electrical activity in the heart muscle. There is a short chapter on methodology, followed by concise discussions of the interpretation of the electrical field in the body produced by the heart. This discussion includes a rationalization between the older established procedures for estimating the electrical axis as the mean frontal plane vector and the more recent estimation of the electrical axis in terms of the mean spatial vector as obtained by the so-called "unipolar" chest and esophageal leads. This introductory section includes an excellent chapter on artefacts and technical errors which are inherent in the newer electronic machines.

In parts 4 through 7, the book accomplishes its chief aim of demonstrating the use of the electrocardiograph in the diagnosis of cardiac disorders by clear and well-chosen reproductions of ECG's. The special attraction of this section lies in the logical arrangement and clear explanation of multiple tracings illustrating the many variations encountered in a single diagnosis. All of the cardiac conditions for which the ECG is helpful in the diagnosis and control of therapy are covered according to their relative clinical importance. Part 8 contains ECG's for practice interpretation. This should be useful to students and practitioners alike. This book should prove particularly useful to medical officers of the Armed Forces.—*Col. W. D. Preston, USAF (MC)*

CENTRAL FOLLICULAR CYST OF THE MANDIBLE

WILLIAM D. BUMSTED, *Major, DC, USA (1)*

CENTRAL follicular or dentigerous cysts are follicular cysts which contain the crown of an unerupted tooth. They arise from the proliferation of the epithelium of the follicular sac of the enamel organ and are associated with unerupted secondary, supernumerary, or occasionally deciduous teeth. These cysts may occur in either the mandible or the maxilla, and the most common teeth involved are impacted third molars, cuspids, and central incisors *(2)*.

Histologically, a central follicular cyst is circumscribed by a tough, fibrous, connective tissue capsule lined with stratified squamous epithelium *(3)*. The cavity is usually filled with serous, cloudy, straw-colored fluid. The contents may be septic or aseptic. The crown of the unerupted tooth projects into the cyst cavity.

Clinically, they are asymptomatic during their early development. Later in their course, they may cause pain and asymmetry of the mandible or the maxilla and may alter the appearance of the face *(4)*.

Pathologically, by the transudation of fluids into the cyst from the perifollicular space, expansive growth produces osteolysis and widespread destruction of bone following the lines of least resistance. The dental and oral pathology section of the Armed Forces Institute of Pathology has found that many adamantinomas have had their origin in follicular cysts.

Roentgenographically, the central follicular cyst reveals a radiolucent area with a well-defined radiopaque line of demarcation circumscribing the cyst and associated with an unerupted tooth.

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(1) U. S. Army Hospital, Camp Stoneman, Calif.

(2) Mead, S. V.: Diseases of the Mouth. 5th edition. The C. V. Mosby Co., St. Louis, Mo., 1940.

(3) Bernier, J. L., and Ash, J. E.: Atlas of Dental and Oral Pathology. 4th edition of previous editions of James B. Mann and Henry M. Goldman. American Registry of Pathology, National Research Council, Army Institute of Pathology, Washington, D. C. 1948.

(4) Winter, L.: Operative Oral Surgery. 3d edition. The C. V. Mosby Co., St. Louis, Mo., 1947.

Figure 1. Roentgenogram of the left side of the mandible showing a follicular cyst circumscribing the crown of an impacted third molar with a radiolucent area of osseous destruction extending into the anterior ascending ramus.

Figure 2. Occlusal roentgenogram of the third molar area of the left side of the mandible showing the buccal, lingual, and distal extent of the follicular cyst shown in figure 1.

Figure 3. Roentgenogram of the right side of the mandible showing a greater than average follicular space circumscribing the crown of the third molar.

The treatment of choice is surgical removal of the unerupted tooth with complete enucleation of the cyst wall. No portion of the cyst capsule should be allowed to remain because the epithelial cells lining the follicular wall have adamantoblastic potentialities. The formation of buds at the basal layer of the epithelium and papillary outgrowth into the lumen are significant danger signs indicating adamantoblastic tendencies *(5)*.

CASE REPORT

A 21-year-old man presented himself to the dental clinic because of pain and occasional swelling of the left side of his face. These symptoms had reoccurred periodically for 18 months. He had no palpable submental, submaxillary, preauricular, or cervical lymph nodes. He had several carious maxillary and mandibular teeth. Both the maxillary and the mandibular third molars were missing. There was a slight elevation of the mucosa in the region of the mandibular left third molar.

Roentgenograms revealed a mesio-angular, impacted, mandibular, left third molar with a radiolucent area about 2.5 cm. in diameter circumscribing the crown (figs. 1 and 2). This radiolucent area extended posteriorly into the ascending ramus of the mandible and was suggestive of a central follicular cyst. The mandibular right third molar was also impacted in the mesio-angular position with a radiolucent area slightly larger than normal for a follicular sac (fig. 3). The maxillary third molars were normal.

A provisional diagnosis of impacted, mandibular left third molar with a central follicular cyst was made, and removal of the cyst advised. Under 2 percent procaine with epinephrine, a vertical incision was made on the buccal aspect of the first molar. The incision was then carried around the cervix of the second molar to its distal aspect. The incision was then extended distally about 1½ inches. The mucoperiosteal flap was retracted and the wall of the cyst exposed. Before proceeding further, a few drops of a yellow, cloudy fluid were aspirated from the cyst and sent to the laboratory for smear and culture. The bone along the lateral wall of the cyst was parchment thick and was removed with a chisel and rongeur until the cyst capsule was well exposed. The dentigerous cyst was then detached as far as possible from its bony crypt. The impacted third molar was elevated along with the greater portion of the cyst. The remaining tags of the cyst membrane were then carefully and completely enucleated from the mandible. The mucoperiosteal flap was replaced and the wound edges closed with black cotton sutures.

(5) Shira, R.: Lecture Syllabus, Letterman General Hospital, Sept. 1951.

The specimen was placed in 10 percent formalin and sent to the laboratory for microscopic examination. Healing was uneventful and the sutures were removed on the fifth postoperative day.

No organisms were seen on smears of the exudate and there was no growth on culture. The pathologist reported that the specimen consisted of a thick, fibrous wall lined by patches of noncornified stratified epithelium. In the intervening areas there was no apparent epithelial lining, and the fibrous tissue lined the cyst wall itself. There were many lymphocytes and plasma cells throughout the fibrous tissue. The clinical diagnosis was confirmed.

DISCUSSION

The roentgenogram of the third molar on the opposite side of the mouth revealed a follicular space which was greater than average for a follicular sac and appeared to be in the formative stage of a follicular cyst, though not as advanced as the one removed. The differentiation between a large follicular space and a true follicular cyst presents a problem. If we had an early roentgenographic criterion which would accomplish this, we could remove follicular cysts at an early stage and thereby prevent later widespread osseous destruction. Also, because follicular cysts are potential adamantinomas, this differentiation deserves serious consideration.

BOOKS RECEIVED

Bodily Physiology in Mental and Emotional Disorders, by *Mark D. Altschule*, M. D., Assistant Professor of Medicine, Harvard Medical School, Boston; Director of Internal Medicine and of Research in Clinical Physiology, McLean Hospital, Waverley; Visiting Physician, Beth Israel Hospital, Boston. 228 pages. Grune & Stratton, Inc., New York, N. Y., publishers, 1953. Price $5.75.

Surgery of the Oesophagus, by *R. H. Franklin*, M. B., B. S., F. R. C. S., Senior Lecturer and Surgeon, Post Graduate Medical School of London; Consulting Surgeon, Kingston Hospital; Late Hunterian Professor, Royal College of Surgeons. 222 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1952. Price $8.50.

Liver Injury, Transactions of the Eleventh Conference, April 30 and May 1, 1952, New York, N. Y., edited by *F. W. Hoffbauer*, M. D., Associate Professor, Department of Medicine, University of Minnesota Hospitals, Minneapolis, Minn. Sponsored by the *Josiah Macy, Jr. Foundation*, New York, N. Y. Printed by Corlies, Macy & Co., Inc., New York, N. Y., 1953. Price $4.

THE FAVORABLE RESPONSE OF ATYPICAL HEMOPHILIA TO CALCIUM

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WILLIAM N. DONOVAN, *Lieutenant Colonel, MC, USA (1)*
MARION F. BEARD, *M. D. (2)*

IN the past few years the problems of hemostasis and the hemorrhagic disorders have been extensively investigated. New diagnostic tools such as the prothrombin consumption test *(3)* have been devised. Some new approaches to therapy, such as use of blood fractions, hormones, and topical anticoagulants, have resulted, but much still remains to be learned.

We recently encountered a patient in whom the prothrombin consumption test proved to be of diagnostic importance in establishing thromboplastic deficiency as the cause of a bleeding diathesis. The appellation of hemophilia calcipriva was considered as possibly applicable to this patient in view of its salient features of hemorrhagic diathesis due to thromboplastin deficiency and an apparent clinical response to calcium. Hess *(4)* originally used this title to describe a patient with hemophilia in whom blood calcium levels were below normal. In our patient, the blood calcium levels were reported as normal.

CASE REPORT

A 24-year-old man was admitted to this hospital on 20 June 1952 because of persistent bleeding following a dental extraction performed a week earlier. He had been in good health until 12 June when his upper left third molar was extracted. Subsequently, he had continued oozing of blood from the alveolar socket despite efforts to control it, including suture, packing with gelfoam, ice packs, et cetera.

On questioning as to episodes of bleeding in the past, the patient stated that at the age of 6 years he was struck on the left

(1) U. S. Army Hospital, Fort Knox, Ky.
(2) Consultant in Hematology, U. S. Army Hospital, Fort Knox, Ky.
(3) Quick, A. J., and Favre-Gilly, J.: Prothrombin consumption test; clinical and theoretic implications. Blood 4: 1281-1289, Dec. 1949.
(4) Hess, A. F.: Calcium factor in hemophilia; case with calcium deficiency. Bull. Johns Hopkins Hosp. 26: 372, 1915.

eyebrow by a rock. This caused a hematoma which gradually spread over the left side of his face, down his neck, and into his pectoral area, discoloring the entire region. In 1945 both his lower third molars were extracted following which he bled steadily over a period of several days. At the time, however, no special attention was given to the bleeding, which spontaneously abated. In 1948, he bled from the gums after a dental prophylactic treatment. After enduring the bleeding for 4 or 5 days, he consulted a physician and was given a calcium preparation by mouth, following which the bleeding stopped. Despite this history of bleeding after dental manipulation, he denied any tendency to abnormal bleeding on sustaining large cuts or abrasions.

His racial background included Scottish, Irish, and English ancestors. His parents and 3 siblings were living and well. His only brother had no bleeding problems, but a first cousin, the son of his maternal aunt and the result of a consanguineous union between first cousins, was a "bleeder."

On admission he was expectorating small amounts of mixed blood and saliva every few minutes. The source of bleeding was identified as the upper left third molar socket, which had been closed by suture, but from which a steady ooze of blood was seen to issue. His blood pressure was 105/75. His nail beds and mucous membranes were of good color. No petechias or ecchymoses were seen. His liver and spleen were not palpable and there were no enlarged lymph nodes.

His bleeding time was 2 minutes, 25 seconds; clotting time, 5 minutes, 10 seconds; and prothrombin time, 13.3 seconds (control 13.4 seconds). His hemoglobin was 15 grams. His erythrocyte count was 5,000,000. His leukocyte count was 9,600, with 58 percent neutrophils, 39 percent lymphocytes, and 3 percent monocytes. His platelet count was 265,000. One ampule of menadione sodium bisulfite was given parenterally every day. His blood calcium was determined on the day following admission and found to be 10 mg. per 100 cc.

In view of the history of previous response to calcium, 10 cc. of 10 percent calcium gluconate was given intravenously and continued for several days along with 1 gram of calcium gluconate 3 times daily by mouth. On the day following the institution of this treatment the bleeding stopped. On that same day the following hematologic data were reported: bleeding time, 9 minutes (patient and technician thought a small artery had been punctured from the briskness of the bleeding); clotting time (Lee-White), 16 minutes; partial clot retraction at 1 hour; and complete retraction in 3½ hours. His hemoglobin was 13 grams. His erythrocyte count was 3,900,000. His leukocyte count was 5,300 with 60 per-

cent neutrophils, 38 percent lymphocytes, 1 percent monocytes, and 1 percent eosinophils. His platelet count was 331,500. Bleeding and clotting times were repeated twice in the next 3 days, during which time the patient's socket healed uneventfully, but slowly, with no further bleeding. These were reported as bleeding time, 1 minute; clotting time, 2 minutes; and bleeding time, 2 minutes, 50 seconds; clotting time, 3 minutes, 30 seconds.

The dentists believed that extraction of the opposite (right) upper third molar was indicated and this was permitted while the patient was still receiving calcium. On 30 June, the morning of the extraction, the blood calcium was 8.9 mg. per 100 cc. No

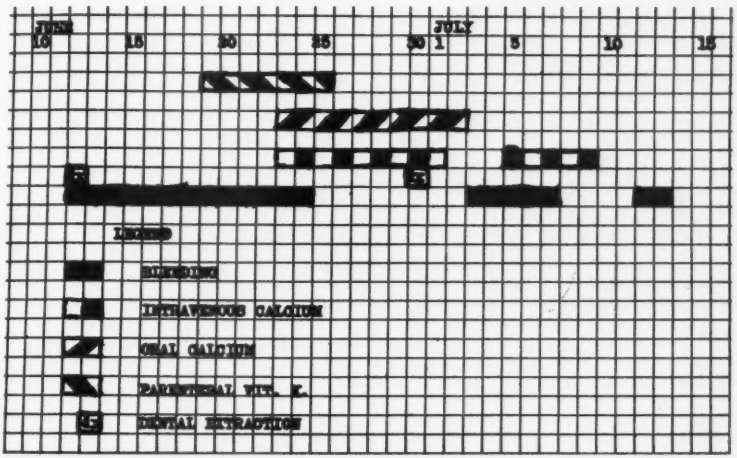

Figure 1. Diagrammatic representation of clinical course and relation to therapeutic measures.

immediate bleeding occurred, although bleeding was immediate and continuous after the first extraction on 12 June. Calcium was not given parenterally after the first day following this second extraction. All calcium was discontinued after the second day. Bleeding at the site of this fresh extraction started on the third postoperative day. Beginning on the fifth day following the second extraction, 10 cc. of 10 percent solution of calcium was given intravenously every day. A bleeding time of 2 minutes, 40 seconds and a clotting time (Lee-White) of 4 minutes was reported on this day. Bleeding ceased on the eighth day, whereupon the calcium injections were stopped. Bleeding did not recur until the twelfth day, and lasted 2 days before ceasing spontaneously (fig. 1).

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In an effort to establish the clinical diagnosis of hemophilia, a prothrombin consumption test was performed on 8 July. This was reported as diagnostic. The results of the tests performed on 8 and 24 July are shown in table 1. Each test was performed in duplicate. Further data obtained on this patient in the interval between these 2 tests were as follows: negative tourniquet test; blood calcium levels of 11.3 and 12 mg. per 100 cc.; prothrombin time of 14.9 seconds (13.6 second control); total protein of 9.1 grams per 100 cc., with albumin 5.5 grams and globulin 3.6 gram (on the same date as the calcium level was reported as 12 mg.); bleeding time, 3 minutes; clotting time, 6.5 minutes; partial clot retraction in 1 hour 15 minutes; complete clot retraction in 4 hours; platelet count, 541,800; alkaline phosphatase of 4 units; and negative cephalin-cholesterol flocculation and thymol turbidity tests.

TABLE 1. *Results of prothrombin consumption tests expressed as prothrombin times in seconds*

Date	Test		Incubation time (minutes)			
			1	15	30	45
8 July	I	Patient	8	15	15	14
		Control	8	15	26	30
	II	Patient	10	12	11.5	11
		Control	12	15	29.5	30
24 July	I	Patient	8.5	9	14	14
		Control	9	16	28	32
	II	Patient	10	12.5	11.5	11.5
		Control	10	16.5	29	30

Comment. Calcium treatment was instituted in this patient largely on the basis of the response of the earlier episode of gingival bleeding. The degree of success encountered was not expected in view of the statements in the authoritative texts and articles on the subject *(5, 6)*. The work of Crane and Sanford *(7)* demonstrated that marked prolongation of the coagulation time appears only when the total calcium is reduced to 2.5 mg. per 100 cc. Moreover, variations in the amount of plasma protein present, which might have altered the proportions of ionized to

(5) Wintrobe, M. M.: Clinical Hematology. 3d edition. Lea & Febiger, Philadelphia, Pa., 1951.

(6) Valentine, W. N.: Diagnosis and management of hemorrhagic disorders. M. Clin. North America 1051-1068, July 1952.

(7) Crane, M. M., and Sanford, H. N.: Effect of variations in total calcium concentration upon coagulation time of blood. Am. J. Physiol. 118: 703-707, Apr. 1937.

nonionized calcium, did not alter this relationship between total calcium and coagulation time. It is widely accepted that calcium participates in the coagulation mechanism in its diffusible ionized form, but Stefanini *(8)* has demonstrated an important "calcium-labile factor complex" from which calcium must be removed before anticoagulant effects of oxalates or citrates can become evident. Conversely, it may be conceivable that such a factor may occasionally be defective. Further investigation along these lines might explain such phenomena as occurred in this patient. We do not offer any theories or explanations for the effect of calcium in this patient, but simply wish to place on record a description of a clinical experience not predicted by available medical literature.

(8) Stefanini, M.: Studies on role of calcium in coagulation of blood. Acta med. scandinav. 136: 250-266, 1950.

BOOK REVIEWS

A Manual of Clinical Allergy, by *John M. Sheldon,* M. D., Professor of Internal Medicine, University of Michigan Medical School; Assistant to the Chairman of the Department of Postgraduate Medicine; Physician in Charge of University of Michigan Allergy Clinics; Director of the Montgomery Allergy Research Laboratory; *Robert G. Lovell,* M. D., Instructor in Internal Medicine, University of Michigan Medical School; and *Kenneth P. Mathews,* M. D., Assistant Professor of Internal Medicine, University of Michigan Medical School. 413 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1953.

This text is prepared, as stated by the authors, for the general practitioner or the specialist in other fields who would like to practice a little allergy and treat the simpler conditions in this field. For this purpose, the text is very well designed. It covers all the fields superficially, discusses both the accepted and controversial issues and refers to the more extensive texts for the more detailed study. It goes into the basic principles of allergy, the antigen-antibody reaction, the different phases of immunity, the atopic state, the shock organs usually affected in allergy, the modes of exacerbation of allergic reactions, and differential diagnosis. The role of histamine is superficially described. There is an excellent chapter on taking the history of an allergic patient and one on the different modes of treatment, including (1) excellent dosage schedules, (2) general instructions regarding dust precautions, (3) eliminating provocative factors, and (4) elimination diets and their variations. It has excellent chapters on the preparation of antigens for both testing and treatment. Most treat this

part of the subject very briefly. Useful charts of the usual offending plants and pictures of their pollens for identification are included. This is an excellent text for the purpose for which it was written.—*Lt. Col. A. J. Berger, MC, USA*

Fundamentals of Clinical Orthopedics, by *Peter A. Casagrande,* M. D., Orthopedic Department of Buffalo General Hospital, Buffalo Children's Hospital, and the University of Buffalo Medical School; Attending Orthopedist at the Chronic Disease Research Institute of the University of Buffalo, and the Veterans Administration Hospital, Buffalo, N. Y., and *Harold M. Frost, Jr.,* M. D., Orthopedic Department of Buffalo General Hospital and the University of Buffalo Medical School, Buffalo, N. Y. Forewords by *Joseph S. Barr,* M. D., and *Frank N. Potts,* M. D. 582 pages; illustrated. Grune & Stratton, Inc., New York, N. Y., publishers, 1953. Price $18.50.

The authors have secured the assistance of a number of additional contributors on special subjects to round out this text. The book is arranged in 9 sections covering (1) basic science; (2) congenital affections; (3) affections of collagen, synovia, and cartilage; (4) affections of bone; (5) tumors and allied disorders; (6) affections of the nerves, muscles, and blood vessels; (7) trauma; (8) amputations, prosthetics, braces, shoes and shoe corrections; and (9) regional orthopedics. Diseases are discussed from the standpoint of cause, clinical manifestations, and treatment. Surgical procedures are referred to but not described. The authors have condensed an enormous amount of information and presented it in a pleasing though superficial manner. The illustrations do not adequately cover the large number of entities discussed. This book would make an excellent text for the student in medical schools as well as a handy office reference book. It provides a ready guide for the advanced student of orthopedic surgery,but it might prove slightly disappointing to the advanced student of the specialty.—*Col. J. W. Batch, MC, USA*

Functional Neuroanatomy, by *Wendell J. S. Krieg,* B. S. in Med., Ph. D., Professor of Anatomy; Formerly Professor of Neurology and Director of the Institute of Neurology, Northwestern University Medical School; 2d edition, revised and augmented. 659 pages; illustrated. The Blakiston Co., New York, N. Y., publishers, 1953. Price $9.

This new edition, appearing 11 years after the first, includes a large number of "3-dimensional" pictures. There are many more illustrations of the gross anatomy of the brain than were present in the earlier edition. The author also commendably avoids the use of eponyms whenever possible. This book is a worthy contribution to the literature. The unique approach to the subject, with the frequent use of slice reconstructions should certainly help the student to grasp this difficult subject.

—*Commander H. S. Colony, MC, USN*

ALLERGIC REACTION TO NIDOXITAL

DOUGLAS F. POWERS, *Captain, USAF (MC)* (1)

NAUSEA and vomiting are common and annoying symptoms in early pregnancy. They are generally believed to be caused by an endocrine imbalance with or without accompanying emotional instability. Many types of treatment have given varying degrees of relief. Nidoxital (2) is a new preparation which is useful in the treatment of emesis gravidarum. It has been used extensively and with excellent results at this hospital. Hurlbutt (3) reported very favorable results from its use in a large series of patients.

The composition of this drug is as follows: benzocaine, 100 mg.; pyridoxine hydrochloride, 50 mg.; nicotinamide, 25 mg.; dl methionine, 100 mg.; and sodium pentobarbital, 15 mg. The manufacturers believe that it reduced the response of the esophagus, stomach, and intestine to afferent stimuli; the sensitivity of the vomiting center; and the amplitude of gastric and intestinal muscular contractions and peristalsis. The pyridoxine component may improve the ability of the liver and gallbladder to utilize unsaturated fatty acids, and the methionine may provide protection for the liver and improve metabolic function. The suggested dosage is 1 or 2 capsules from 30 to 40 minutes before meals; for severe vomiting, 1 capsule may be given every 45 minutes for 3 doses and this dosage repeated in 4 hours, if indicated.

Descriptive literature states that the preparation appears to be without toxic reactions even in large doses, and observers (4) have noted the absence of undesirable side effects. No reports of its toxicity have been found. This article describes a patient in whom an allergic reaction appeared following the ingestion of nidoxital.

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(1) U. S. Air Force Hospital, Fairchild Air Force Base, Wash., at time of writing; now at University of Virginia Hospital, Charlottesville, Va.

(2) Product of Ortho Pharmaceutical Corp., Raritan, N. J.

(3) Hurlbutt, F. R.: Use of nidoxital in emesis gravidarum. Am. J. Obst. & Gynec. 59: 458-460, Feb. 1950.

(4) Personal communication.

CASE REPORT

A 28-year-old married woman reported that she had not menstruated for 2 months and that in the preceding 2 or 3 weeks she had been severely nauseated and had occasionally vomited in the early morning. A diagnosis of pregnancy was made. There was a history of nausea and vomiting during the first trimester with each of her 2 previous pregnancies. Nidoxital was prescribed and after returning home the patient took a capsule. About 1 hour later she was brought back to the clinic by her husband who stated that she suddenly had become ill about 30 minutes after taking the drug. She complained of lightheadedness, shortness of breath, a generalized rash, intense itching of the skin, and swelling of all extremities.

On examination she appeared apprehensive. There was marked urticaria of the entire body, particularly of the face and extremities, and moderate edema of the extremities. There was no history of any previous attacks, or of asthma or hay fever in the patient or her family. Recovery was prompt after treatment with epinephrine and antihistaminics. It was concluded that her symptoms were an allergic response to one or more of the several drugs in nidoxital.

DISCUSSION

This report describes the composition and actions of nidoxital in the treatment of nausea and vomiting of pregnancy, the generally good results obtained from its use, and the usual absence of toxic reactions. The case described is significant because it is believed to represent an allergic reaction to this proprietary prescription not previously reported in the literature. It emphasizes the importance of a thorough inquiry into possible drug sensitivity in a patient before prescribing a medication.

BOOK RECEIVED

Amebiasis, Pathology, Diagnosis and Chemotherapy, by *Hamilton H. Anderson*, M. D., Professor and Chairman, Pharmacology and Experimental Therapeutics, School of Medicine, University of California Medical Center, San Francisco, Calif.; Dean of the Medical Faculty, American University of Beirut, Beirut, Lebanon, 1950-1951; *Warren L. Bostick*, M. D., Associate Professor of Pathology, Department of Pathology, School of Medicine, University of California Medical Center, San Francisco, Calif.; and *Herbert G. Johnstone*, Ph. D., Professor of Parasitology, Parasitology and Mycology Section of the Department of Medicine, School of Medicine, University of California Medical Center, San Francisco, Calif. 431 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1953. Price $11.50.

ISOSPORA INFECTION IN MAN

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AUGUST J. BUCKI, *Chief Hospital Corpsman, USN (1)*

ABOUT 300 patients with intestinal infection due to isospora have been reported in man since 1915, and of those reported prior to World War II, about 75 percent were from the eastern Mediterranean area. During and since World War II, a number of such patients have been reported from other areas. Barksdale and Routh *(2)* described 50 cases in Americans stationed in the southwest Pacific, 44 of whom were in the Philippines. They were, however, unable to find isospora in examination of stool specimens from 750 Filipinos. Meira and Corrêa *(3)* found isospora in 28 persons out of a total of 28,836 stool examinations in Sao Paulo, Brazil, between 1942 and 1950. Of this number, 13 had *Isospora belli* and 15 had *Isospora hominis*.

It appears that isospora infections are relatively rare in the temperate regions and few cases have been described from the United States. Magath *(4)* found 1 case in 60,000 examinations and Faust *(5)* did not observe a single infection in the examination of 75,000 stools over a period of 16 years. Markell *(6)* reported 2 cases.

Oocysts of *I. belli* (Wenyon, 1923) were observed in a stool specimen received in our laboratory on 24 December 1952, and were demonstrated in repeated specimens received from the patient during the following 18-day period.

CASE REPORT

The patient had been stationed in Sao Paulo, Brazil, since July 1950. He departed via ship from Sao Paulo on 19 November 1952 and arrived in New Orleans on 4 December. After spending several days in New Orleans, he proceeded to Washington, D. C.,

(1) Division of Parasitology, U. S. Naval Medical School, National Naval Medical Center, Bethesda, Md.

(2) Barksdale, W. L., and Routh, C. F.: Isospora hominis infections among American personnel in southwest Pacific. Am. J. Trop. Med. 28: 639-644, Sept. 1948.

(3) Meira, J. A., and Corrêa, M. O. A.: Isosporose humana; consideracoes sôbre 28 casos. Rev. Inst. Adolfo Lutz 10: 117-139, 1950.

(4) Magath, T. B.: Coccidia of man. Am. J. Trop. Med. 15: 91-129, Mar. 1935.

(5) Craig, C. F., and Faust, E. C.: Clinical Parasitology. 5th edition. Lea & Febiger, Philadelphia, Pa., 1951.

(6) Markell, E. K.: Infection with Isospora hominis; report of 2 cases. J. Parasitol. 36: 500-501, Oct. 1950.

arriving about 15 December. He was admitted to the hospital for medical observation on 22 December, complaining of diarrhea accompanied by severe abdominal discomfort. He had become ill en route from Brazil but attributed his illness solely to motion sickness. The diarrhea had persisted however, and, at the time of admission, he was passing an average of 4 stools a day. He was discharged from the hospital on 14 January 1953, his condition greatly improved.

Stool examinations. Eight stools were examined between 24 December and 13 January. All specimens were light yellow and were liquid to semisolid except the last which was brown and partially formed. Charcot-Leyden crystals were numerous in all specimens. Incompletely digested food particles were noted in all and mucus was absent. Pus cells were present in large numbers but no blood was noted.

Immature oocysts of isospora, containing a single unsegmented zygote, were observed in direct examination of wet-mount preparations of the 7 specimens received prior to 13 January. Repeated examinations of the final specimen received on that date failed to reveal the parasite.

The number of oocysts found was quite constant in direct examination of wet-mount preparations of each specimen and averaged about 1 per coverglass preparation, but, in the final positive specimen (of 10 January), they averaged 1 per 4 coverglass preparations.

Although repeated examinations of all specimens submitted were made, no other parasites (protozoa or helminths) were observed.

Bacteriology of the stool. Specimens cultured on 23 and 24 December were negative for enteric pathogens.

Hematology. Five blood examinations made between 23 December and 5 January showed a slight increase in eosinophils with counts ranging from 5 to 9 percent, 3 of the 5 showing 9 percent.

Description of the oocysts. All stool specimens were received soon after passage and in every case only unsegmented oocysts (fig. 1) containing a single granular mass were observed at the time of the initial examination. The thick-walled, transparent cysts varied greatly in size, ranging from 25 to 29.9 microns in length by 10.4 to 19.2 microns in breadth, with an average size of 27.8 by 13.8 microns. The oocysts were elongated and, in most cases, one end was slightly more constricted than the other. None showed the pronounced necklike appearance described by some authors as being characteristic of the species.

Stools received on 24, 26, and 30 December were kept at a temperature of from 80 to 85° F. for several days. A large number of oocysts contained 2 sporoblasts at the end of 36 hours (fig. 2) and, within 48 hours, most of the cysts had completed their development (fig. 3) of 2 oval sporocysts, each containing 4 sporozoites. Measurements of the sporocysts gave average dimensions of 13.2 by 8.1 microns.

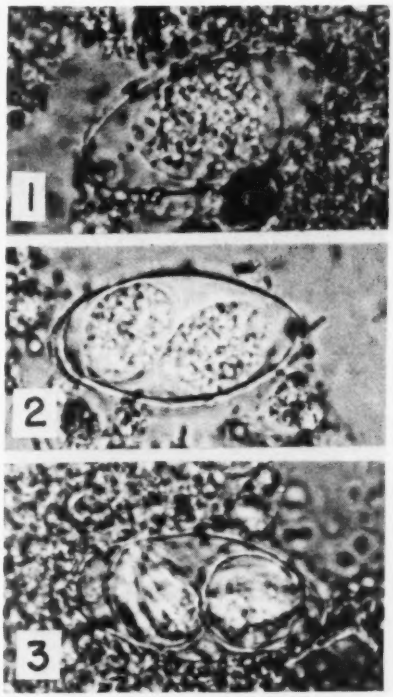

Figure 1. Oocyst from freshly passed feces. X 1200. Figure 2. Maturing oocyst with 2 sporoblasts. X 1200. Figure 3. Mature oocyst with 2 sporocysts, each containing 4 sporozoites. X 1200. (All photomicrographs by W. E. McLaughlin, HMC, USN.)

DISCUSSION

It is difficult to ascertain where the patient acquired his infection. Although a period of 34 days had elapsed from the time of departure for the United States until he was admitted to the hospital, we are assuming that the infection was acquired in Sao

Paulo, Brazil. Matsubayashi and Nozawa *(7)* reported 2 experimentally infected patients in whom oocysts appeared in the stools 9 and 11 days after infection and were observed in subsequent examinations for more than a month. Likewise various authors *(2, 4, 8)* believed that with isospora infections, the oocysts are not observed until a considerable time has elapsed following the patient's initial complaints. Because laboratory examinations, both bacteriologic and parasitologic, failed to reveal another possible causative agent, we believe that the patient's symptoms were probably due to the isospora infection. Unfortunately we were unable to obtain stool specimens after the patient was discharged from the hospital.

SUMMARY

A case of isospora infection in man is reported in which symptoms were probably due to an infection with *I. belli*. Although the parasite was first demonstrated in specimens examined after the patient had arrived in the United States, the infection was probably acquired in Brazil.

(7) Matsubayashi, H., and Nozawa, T.: Experimental infection of Isospora hominis in man. Am. J. Trop. Med. 28: 633-637, Sept. 1948.

(8) Markell, E. K.,; Mullinger, P. E.; and Schneider, D. J.: Intestinal parasitic infections in naval personnel. Am. J. Trop. Med. 27: 63-65, Jan. 1947.

BOOK REVIEW

Hypnosis in Modern Medicine, edited by *Jerome M. Schneck*, M. D., Clinical Associate in Psychiatry, College of Medicine, State University of New York; Psychiatric Consultant, Westchester County Department of Health (N. Y.); Founder and President, The Society for Clinical and Experimental Hypnosis. 323 pages. Charles C Thomas, Publisher, Springfield, Ill., 1953. Price $7.50.

This book represents the contribution of a group of authors to the present-day thinking of those who use hypnosis in their practice. Many of the contributors have been trained in psychiatry, although those who have not had such training have apparently received rather intensive indoctrination in psychiatric orientation and the technics of hypnosis. Because of the number of contributors, there is some overlapping and there are some conflicting comments in this book, but this is necessary for this type of contribution to present thought. The sections on the use of hypnosis in obstetrics and dentistry are especially complete and lucid.—*Maj. J. F. Donovan, MC, USA*

EXTRAVASATED METALLIC MERCURY SIMULATING OSTEOMYELITIS

VICTOR B. VARE, JR., *Lieutenant Colonel, MC, USA (1)*

SINCE Harris *(2)* first reported a rapid method of intubation of the Miller-Abbott tube by the use of metallic mercury in the balloon, complications have been reported following rupture of the balloon with escape of the metallic liquid *(3–6)*. In my patient the extravasation of metallic mercury simulated chronic osteomyelitis of the right wing of the ilium.

CASE REPORT

A 19-year-old soldier sustained a perforating abdominal wound on 21 September 1950 in Korea. After emergency first aid his small bowel perforations were sutured and an ileostomy and cecostomy were performed at a front line surgical hospital. Miller-Abbott tube drainage was instituted and passage of the tube was expedited by the use of metallic mercury in the balloon. The patient was evacuated through military channels to Hawaii where on 12 October an ileocolostomy was performed. While in Hawaii the balloon of the Miller-Abbott tube ruptured and metallic mercury was disseminated throughout the terminal ileum, large bowel, peritoneal cavity, and pelvis. He arrived at this hospital by transfer on 20 November at which time physical examination revealed a 6-inch healed left paramedian rectus incision. In the right lower abdominal quadrant there was a large defect measuring 3 by 3 inches which was granulating and epithelizing from the edges. In the center of this area, the cecum, ileocecal valve, and about 2 inches of the distal ileum were visible. A sinus tract, which when gently probed appeared to extend through the iliac crest, was lateral to the granulating area. The discharge

(1) Valley Forge Army Hospital, Phoenixville, Pa.

(2) Harris, F. I.: New rapid method of intubation with Miller-Abbott tube. J. A. M. A. 125: 784-785, July 15, 1944.

(3) Lindenmuth, W. W.: Fecal fistula due to metallic mercury from Miller-Abbott tube; report of case. J. A. M. A. 141: 986-987, Dec. 3, 1949.

(4) Hoffman, I. L.: Spontaneous evacuation of metallic mercury from vermiform appendix. Bull. U. S. Army M. Dept. 8: 802-803, Oct. 1948.

(5) Miller, T. G.: Personal communication.

(6) Vigliani, E. C.: Infortunio da penetrazione di mercurio metallico nel sottocutaneo e sue consequenze. Med. d. lavoro 37: 7-13, Jan. 1946.

was grossly purulent. Roentgenograms of the abdomen were negative except for the presence of a puddle of pooled mercury at the superior aspect of the right sacro-iliac joint (fig. 1). After general supportive therapy a resection of an isolated loop of terminal ileum and right colon was performed on 8 December with a primary wound closure of the fascial defect by means of a pedicle flap. The patient made an uneventful recovery from the operative procedure, but the sinus over the lateral aspect of

Figure 1. Roentgenogram showing the deposit of metallic mercury in the region of the right sacro-iliac joint and destruction of the wing of the right ilium.

the wing of the right ilium remained unchanged. Culture of the purulent exudate demonstrated *Aerobacter aerogenes*. Injection of lipiodol into the sinus subsequently demonstrated ramifying sinus tracts about the bone and communicating with the extravasated puddle of mercury. Barium intestinal studies failed to reveal the presence of an intestinal fistula. Roentgenograms of the pelvis revealed deformity of the wing of the right ilium with some sclerotic changes indicative of a chronic osteomyelitis. Radical excision after the method of Badgley (7) was performed on 27 March 1951. In the course of the operation, the puddle of metallic mercury was uncovered in the fascial sheaths of the sacrospinalis muscles and the material evacuated. Several cultures of the excised sinus tract extending in and about the affected bone gave no growth after 72 hours. Primary closure of the wound resulted in healing by first intention and the patient's course was uneventful. The only residuum was a mild gluteal gait on the right.

(7) Badgley, C. E.: Osteomyelitis of ilium. Arch. Surg. 28: 83-124, Jan. 1934.

Discussion. The only source of the metallic mercury was from the Miller-Abbott tube balloon. The puddle accumulated in the subcutaneous soft tissues either through an existing fistula due to the bullet wound or various abdominal operative procedures. Cultures taken at the ostium of the persisting sinus showed *A. aerogenes,* but several cultures of the sinus tracts containing necrotic granulation tissue and communicating with the puddle of mercury taken at the time of operation were sterile. Periosteal reaction resulted in deformity of the bone which grossly simulated a chronic osteomyelitis. Surgical excision of the affected bone and mercurial deposit affected a complete cure. There were no constitutional toxic symptoms or signs. In general it would appear that the use of mercury in the balloon of a Miller-Abbott tube should be avoided in any patient with a known wound of the gastrointestinal tract.

BOOK REVIEWS

The Anatomy of the Domestic Animals, by *Septimus Sisson,* S. B., V. S., D. V. Sc., Late Professor of Comparative Anatomy in the Ohio State University, Columbus, Ohio; Member of the American Association of Anatomists; Fellow of the American Association for the Advancement of Science. Revised by *James Daniels Grossman,* G. PH., D. V. M., Professor of Veterinary Anatomy in the College of Veterinary Medicine, Ohio State University, Columbus, Ohio. 4th edition, revised. 972 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1953.

This new edition contains sections on osteology, arthrology, myology, splanchnology, the respiratory system, the urogenital system, male genitalia, female genital organs, angiology, neurology, esthesiology, and the chicken in that order. Each of these sections, with the exception of the last-named, contains a detailed description of the concerned anatomic system of the horse. The ox, pig, sheep, and dog, generally speaking, are dealt with comparatively. Some sections contain comparative descriptions of structures in the sheep, and others do not. When they do not, the descriptive material pertaining to the cow may or may not carry the parenthetical statement: "They are the same in the sheep." A greater consistency in dealing with anatomic systems would have enhanced the book's value.

The principal changes in this edition include a rearrangement of the material that is found in the first part of the section dealing with osteology. Osteologic descriptive terms which were to be found in the previous editions have been placed in the introduction along with other definitions. Thirteen illustrations have been

added. Two of these which deal with the "stay apparatus" of the equine leg are particularly valuable. A new feature that contributes to the new edition's general interest is a short biographical sketch and picture of the author. The subject matter is clearly and simply presented, is well indexed, and uses the authoritative terminology of the American Veterinary Medical Association's publication "Nomina Anatomica Veterinaria."

—*Lt. Col. K. H. Willers, VC, USA*

Essentials of Body Mechanics in Health and Disease, by *Joel E. Goldthwait,* M. D., F. A. C. S., Ll. D., Sc. D.; *Lloyd T. Brown,* M. D., F. A. C. S.; *Loring T. Swaim,* M. D.; and *John G. Kubns,* M. D., F. A. C. S., Sc. D. 356 pages; illustrated. 5th edition. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1952.

The first portion of this handbook vaguely associates body mechanics with a large group of diseases and disabilities, discusses the various body types, and outlines simple descriptions of body mechanics, including adaptive changes occurring in adolescence. The authors then discuss the relationship of body mechanics to backache, the circulatory system, abdominal viscera, and the nervous system, and the role of posture and mechanics in arthritis. There is a chapter on postural exercise with a few general principles regarding braces and the use of plaster. Further discussion relates the foot to body mechanics and the role of body mechanics in public health and geriatrics. The book is simply written and gives the impression that the correction of faulty body mechanics plays a large role in the prevention and treatment of practically all functional and organic diseases. It is difficult to recommend this book as offering any concrete help in the teaching or practice of medicine, or any of its specialties. No new concepts in the recognition or management of disease are suggested, and all conclusions are vague. It might possibly be recommended as casual informative reading for a student of physical medicine.—*Lt. Col. S. J. Ritchey, MC, USA*

Connective Tissues, Transactions of the Third Conference, February 14-15, 1952, New York, N. Y., edited by *Charles Ragan,* Department of Medicine, College of Physicians and Surgeons, Columbia University, New York, N. Y. Sponsored by the *Josiah Macy, Jr. Foundation.* 166 pages; illustrated. Printed by Progress Associates, Inc., Caldwell, N. J., 1952. Price $3.50.

This book reflects the opinions of outstanding authorities. Technical discussions, descriptions of connective tissue staining, and a discussion on the fine structure of connective tissues are carefully recorded and illustrated with photomicrographs. Clinical implications are stressed; the nature of reticulin is described; and experimental results with ACTH and cortisone are referred to. This book should be of particular interest to pathologists and clinicians.—*Col. C. T. Young, MC, USA*

PLANNING PRINCIPLES OF A MILITARY HOSPITAL SYSTEM

ERNEST T. SHEEN, *Colonel, MSC, USA (1)*
ISAAC COGAN *(2)*

THERE is a basic difference in the type and scope of problems and their methods of solution confronting a person on duty in a hospital and one doing staff work in the Office of the Surgeon General. The former helps solve many problems, most of them requiring immediate solution, for one hospital while the latter helps solve a few problems, much broader and more lasting in character, for many hospitals. The difference in approach and point of view of the field and staff officers stems from the difference in basic problems and each view is quite proper in its place.

FUNDAMENTAL CONSIDERATIONS

Basic realities. Before the declaration of the limited emergency in 1939, the Army operated 5 general hospitals in the United States. On V-J Day a total of 65 were functioning with a peak load of over 240,000 patients; over 800,000 hospital beds were in operation, world-wide, of which 550,000 were in the continental United States. It took more than 750,000 Army Medical Service personnel to operate this hospital system. With demobilization, the largest hospital system in the history of the world was greatly reduced but since the start of the Korean campaign it has expanded to about 2½ times what it was just before July 1950.

The core of all Medical Service planning is the hospital-bed requirement, which must be based on the decisions and broader plans of the General Staff and must embody the basic policies and goals of the Medical Service, anticipated desires of the Secretary of Defense, the Director, Bureau of the Budget, and other agencies. The planning process of a single problem may take weeks or months to complete. When the plan is approved and placed into operation, it becomes the authority for subsequent facility, supply, and personnel planning and actions. The latter may involve the expenditure of millions of dollars for materials

(1) Medical Plans and Operations Division, Office of The Surgeon General, Department of the Army, at time of writing; now at Letterman Army Hospital, San Francisco, Calif.
(2) Chief, Resources Analysis Division, Office of The Surgeon General, Department of the Army.

and services. Once the plan is placed in operation, deviations are authorized only when significant changes in the situation justify such action.

The Surgeon General's Office must make (1) estimates for normal operations 7 years in advance; (2) preliminary budgetary estimates 3 years in advance; (3) final budgetary estimates 1 year in advance; (4) mobilization plans through M plus 36; (5) operational plans 6 months in advance but subject to daily adjustment; and (6) operational authorizations every month in order to meet current situations and requirements.

The first step in solving a new problem should be to break it down into many smaller ones. A good solution to each small problem means success in solving the main one. A wise procedure in solving any problem is to look for a precedent. An intelligent evaluation of the past is our only guide for both the immediate and projected situations.

National military policies vitally affect hospital planning. Table 1 gives the size of the Army hospital system at various periods. No records have been found which list the total number of hospitals and hospital beds prior to the Civil War, but records of the Revolutionary War indicate that on 2 March 1776, the sick of the Army numbered 2,765 out of a strength of 18,524. Four general hospitals were established, but it is not known whether they were operating concurrently. During the War of 1812, seven general hospitals were established.

Shortly after the end of the Spanish American War the President appointed a commission to investigate the conduct of the War Department in the War with Spain. Some of the more important medical problems were:

1. The Medical Department was neglected because it cost money and because as a noncombatant branch it was considered to be of little importance.

2. Two serious mistakes were made by Medical Department personnel. They underestimated hospital requirements by using the peacetime rates prevailing for the Regular Army (1 percent in camp infirmaries and 3.5 percent in general hospitals); and they assumed that typhoid fever was carried only by contaminated water.

Remedial action taken as a result of this report rapidly improved the quality of Army medical service.

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TABLE 1. *Size of Army hospital system*

Year	Period	Number of hospitals	Total number of beds	Source of information
1864	Civil War	204	136,894	General hospitals only, Union Army*
1875	Peacetime	140	2,520	Annual Report, Office of the Surgeon General
1899	Spanish American War	Unknown	15,600	Estimated from data in Annual Report, Office of the Surgeon General
1916	Peacetime	140	9,530	The Medical Department of the U. S. Army in the World War, Vol. V, 1923.
Nov. 1918	World War I	244	397,363	Same (does not include small hospitals)
30 June 1935	Peacetime	129	12,541	Annual Report, Office of the Surgeon General
Sept. 1945	World War II	952	808,330	Resources Analysis Div., Office of the Surgeon General
30 June 1950	Peacetime	81	26,481	Medical Statistics Div., Office of the Surgeon General
30 June 1951	Korean campaign	158	72,835	Medical Statistics Div., Office of the Surgeon General

*Surgeon General's Office, War Department: Medical and Surgical History of the War of the Rebellion, Part III. Government Printing Office, Washington, D. C., 1888. Chap. 12.

CURRENT FACILITY, SUPPLY, AND STAFFING FACTORS

In determining the size of a hospital plant, the current complex plans for construction call for over 700 square feet of floor space per operating bed. This includes, in addition to the space required for wards, operating rooms, clinics, laboratories, the x-ray service, mess halls, kitchens, offices, storage and recreational space, et cetera. The multistoried hospital is the most economical for permanent construction because it requires less land and materials for building. The operating costs of the multistoried hospitals are also less than those of a cantonment type of hospital.

The hospital admission rate is affected by seasonal fluctuations in the incidence of certain diseases and a hospital must have the capacity to expand to meet these additional requirements. This is considered in designing and constructing a hospital by providing 100 square feet of floor space per bed in wards so that, for temporary periods of time, the floor space can be reduced to 72 square feet per bed.

A 1,000-bed hospital requires about 440 tons of supplies and equipment before it is ready to receive patients. Over 8,000 different items, most of which are for hospital use, are presently listed in the Armed Services Catalog of Medical Materiel. Over 1,200 of these are listed as critical articles in Appendix II of the Munitions Board Requirements Manual. Over 500 of these critical items require 9 months or more from the date the purchase order is placed until the article is installed in a hospital and ready for use. These include x-ray equipment, sterilizers, and practically all highly technical equipment.

From the modest beginning of the physician and hospital steward, a hospital staff today requires over 100 persons per 100 operating beds. A hospital staff requires over 200 military occupational specialists among the officer personnel and 75 among the enlisted personnel. Civilians also may be included in both categories. Many of these people must not only be procured, but also must be trained before they can be used effectively.

A directive from the Secretary of Defense requires the Army to use "occupied beds" as the basic unit for personnel requirements and funding. The number of beds occupied in the Army hospital system will vary from month to month, not only with changes in strength, but also with the mission and activity of troops, the season of the year, and many other factors. These fluctuations are even sharper in individual hospitals. Figure 1 shows the average seasonal fluctuation in number of beds occupied for a constant number of Army troops in continental United States over the last 3 years and the levels at which operation and staffing of the hospital system is planned.

It is practically impossible to adjust facilities, personnel, and other operating resources of an Army hospital with each fluctuation of the patient load. Personnel and fund authorizations are allotted to the Army on a fiscal-year basis long before the period of their use. Subauthorizations to commands are also made in advance of their use. There is usually a lag of from 3 to 6 months between the time that a requirement for personnel or equipment

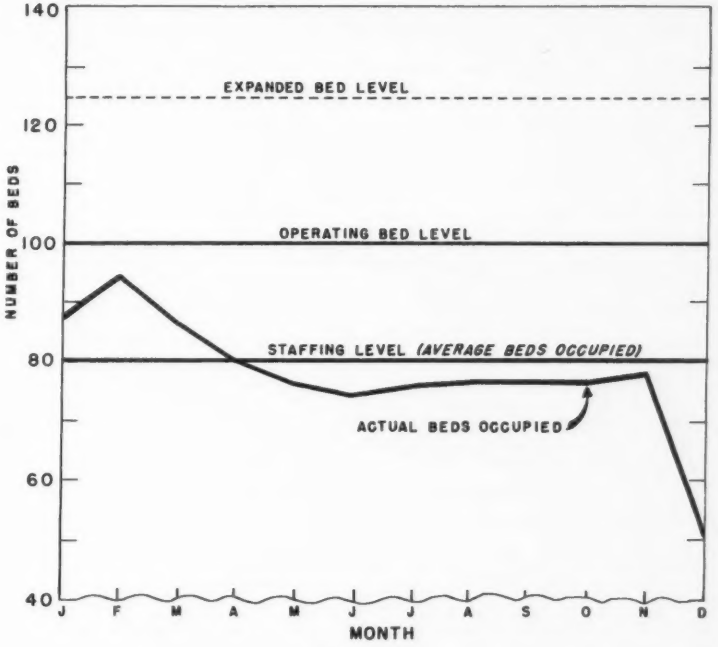

Figure 1.

is established and the time the resource is available for use at the hospital. It is therefore essential to establish requirements for the various resources used in a hospital at a level which would be fairly constant throughout the year and still permit the absorption of a fluctuating workload. In current planning, this level (often called staffing level) is the average number of occupied beds anticipated for the year (excluding December because of the high furlough rates in that month). Practically all the resources of a hospital are authorized on this basis, even though sometimes expressed in other terms.

Staffing guides are often *expressed* in terms of operating beds authorized, but they are *calculated* on the basis of occupied beds. This is possible because operating beds are established at a

constant relationship to average number of beds occupied. The number of operating personnel of a hospital is planned and authorized on the basis of the average number of beds to be occupied during the year. As shown in figure 1, the patient load is above this level for about 3 months of the year. This means that, during this period, personnel must work above normal capacity, leaves being curtailed, and some personnel working longer than normal hours. It is generally accepted that this type of operation cannot be maintained efficiently for more than 3 months in succession. During the rest of the year, the workload stays at or below the average, permitting normal operation and, during the low seasonal periods, concentration of leaves and training.

The operating bed level of a hospital is set at 25 percent above the average number of beds occupied. Experience has shown that all wards of a hospital cannot be filled simultaneously, and that necessary segregation of patients by diagnosis and sex results in about 20 percent of the operating beds being unoccupied when the hospital is operating at peak efficiency. The expansion capacity is roughly 25 percent above the operating bed level.

OBJECTIVES IN HOSPITAL PLANNING

The highest type of medical care must be provided at all times. The basic reasons why medical service is provided for the Army may be classified as humanitarian, morale-building, obligatory, economic, and promoting military efficiency.

1. Humanitarian. Army Medical Service personnel are authorized to treat noncombatant civilians in a theater of war and enemy prisoners of war. Our government has incurred certain legal responsibilities in this respect as a cosigner of the Geneva Convention. A person who is sick or wounded needs help and it is our duty to give him aid when we can.

2. Morale. The knowledge of the ready availability of adequate medical service is one of the strongest factors in building morale and physical courage among troops. Conversely the absence of such facilities fosters undue caution on the part of the soldier in combat.

3. Obligation. When a citizen is selected to serve in the Armed Forces, he is meeting his obligation to his government. The latter in turn has a moral obligation to supply him with his essential needs, including medical service.

4. Economic. In order to salvage the victims of war for useful service, they must be treated and rehabilitated insofar as is humanly possible. The Veterans Administration is responsible for long-term rehabilitation, but its success depends on early steps in this direction.

5. To increase military efficiency. Our major reason for existence is to increase military efficiency by assuring the physical fitness of inductees, by preventive measures, and by returning patients to duty as quickly as possible.

LOCATION OF HOSPITALS

The *categories of patients* are significant factors in planning the location of a hospital. For this purpose, military patients on active duty may be divided into those who are expected to return to duty (1) after a short period of hospitalization (from 65 to 70 percent) and (2) after a relatively long period of hospitalization if at all.

For the first group, hospitalization should be provided on, or near, the post where a patient is stationed. This will facilitate his remaining assigned to his unit and being under its administrative control. For morale purposes, a soldier should remain assigned to his unit. Patients requiring prolonged hospitalization should be hospitalized as near their homes as possible. This reduces the cost of transportation and encourages the visits of friends and relatives. If such a patient is to be separated from the service, a saving in the cost of transporting his dependents and his household goods will result. Hospitalization of long-term patients near their homes is also the desire of the Congress. The Surgeon General receives many pleas from members of Congress, state officials, veterans organizations, relatives, and friends for the transfer of a patient to a hospital nearer his home. When such requests cannot be granted, the reasons often have to be formally presented to the Secretary of the Army.

A patient who will require hospitalization in excess of 90 days is transferred to a medical holding detachment at an early date. This permits ordering a replacement to his unit. If, on completion of hospitalization, he is to be returned to duty, he gets into the replacement channels of the Adjutant General.

Economic considerations. Hospitals for patients requiring prolonged hospitalization should be located near large centers of population. Most of such patients require highly specialized care which can be adequately provided only by a specialized staff. In the interest of efficient use of such resources, it is necessary to concentrate these patients in relatively large hospitals.

Based on the above considerations, about two-thirds of the beds in the Army hospital system should be located near troop concentrations and one-third near large centers of population. This ideal distribution must be modified, however, by the fact that hospitalization for patients in oversea areas who will be in

the hospital for more than 120 days, or who are not expected to return to duty, is provided in the continental United States. Assuming that about 50 percent of the Army strength is deployed to oversea areas, the desirable distribution of beds in the Army hospital system would be one-third in oversea areas, one-third near troop locations in the United States, and one-third near large population centers. The Army has, however, hundreds of millions of dollars invested in its present hospital facilities. This ideal distribution must, therefore, be modified in the interests of economy and the efficient use of already available facilities. Furthermore in wartime, battle casualties evacuated to the continental United States represent an additional workload for the large specialized treatment hospitals. This results in a greater demand for beds in these hospitals.

In determining the site for a specialized treatment hospital, the following factors must be considered: (1) location with respect to the activities or areas served by the installation and the general distribution of installations of similar type; (2) location, communications, and accessibility with respect to the principal centers of population; (3) the availability of expert civilian consultants to aid in maintaining high standards of professional care; (4) logistic problems involved in the transportation of personnel and supplies to and from the installation; (5) size of hospital with reference to terrain, climate, water supply, and other physical characteristics; (6) feasibility of constructing permanent facilities; (7) present state of development and costs of future development; (8) economy of operation and maintenance; (9) ability of the local community to support the installation with respect to housing for dependents, schools, churches, retail stores, and recreation; (10) availability of power and local civilian labor; (11) the degree and type of development, and value of real estate in the vicinity; (12) civil interest in its later use for nonmilitary purposes; (13) impact on the civilian economy in the locality; and (14) strategic and tactical considerations.

THE SIZE OF THE HOSPITAL SYSTEM

In order to determine the size of the hospital system, it is necessary to begin with the factors which influence the size of a single hospital. The operational size of any hospital is primarily related to the number of persons the hospital serves. In accordance with the policies of the Department of Defense it may be necessary to include the strength of personnel of the Navy or Air Force in computing bed requirements for an Army hospital. A hospital may furnish primary medical care and in addition have a specialized treatment mission. This in turn necessitates having strength figures for the area to be served.

Beds for facilities are computed on or near estimated peak loads. If a post is expected to double its strength in 5 years, any new construction should be large enough to take care of the projected strength. Although fluctuations are planned for in computing the patient loads of individual hospitals, different hospitals in the system will reach their peak loads at different times. This may create a requirement for more beds in the system as contrasted with the requirements for a single hospital.

For many years, planners in the Surgeon General's Office based bed requirements on a ratio to the strength served. Currently much weight is given to actual hospitalization experience. The latter factor requires consideration of the mission of a command, the deployment of troops, and the military strength. The preceding year has been found to be the best time period in applying the experience rates. Current hospital operations must be based on short-range plans and the preceding year will give an indication of the seasonal incidence of diseases.

A hospital is considered full when it is 80 percent occupied. This is difficult to explain to anyone not well versed in military medical logistics. Because some civilian hospitals operate near maximal capacity, the question is frequently asked: Why cannot the Army do so? The few civilian hospitals which operate in this manner can adopt such a policy because they turn away patients when a bed is not available. Because active Army personnel must be provided hospitalization, when required, an Army hospital needs a reserve of beds above the estimated average occupancy. Patients are segregated by sex, communicable disease, and type of treatment required. An empty bed in a surgical ward is not available for a patient with pneumonia or a psychosis. Although volume 6 of the Bulletin of the Hospital Council of Greater New York for June 1950 reported that the municipal hospitals of that area were overcrowded most of the time, the average occupancy of the civilian hospitals in the same area was 72 percent as compared with 80 percent currently planned by the Army.

The mission of a command. The present Army policy is to concentrate troops in large numbers at training installations in the United States. A glance at table 1 indicates that the current number of operating hospitals approximates the number in 1875, although the present strength of the Army is several times larger than it was then, as is the number of available beds.

Commands where basic training is a primary mission have higher hospital admission rates than installations composed of seasoned troops. At the former, large numbers of recruits are brought together from different localities. Those from rural areas are particularly susceptible to childhood diseases. These hospitals also admit a large number for physical evaluation.

The installation housing seasoned troops may also have special problems, dependent on its mission. For example, in an airborne division, many orthopedic casualties must be expected.

A small command may be located away from the main body of troops. If other Department of Defense hospital facilities are not available, it may be necessary to provide Army hospital facilities for such a command even though it is not economical to do so.

In the Far East Command, a mission presently exists that differs from that of other overseas theaters, namely, combat activities. In addition to the factors determining the size and number of hospitals required for that command, the factor of casualty rates enters into the planning requirements. Here, too, experience is a valuable guide. Statistics are gathered and carefully analyzed at frequent intervals as an aid in keeping abreast of the hospital problems in the Far East and their effect on the zone of the interior.

Because the present policy is to retain the nonvoluntary personnel for 2 years, a large number of men become eligible for separation each month. They must have physical examinations and evaluation of any disabilities thereby detected.

The intensity of training activities is another factor affecting hospital admission rates. The tendency to greater realism in training programs has increased the rate of admissions for injuries above the Army average. Emphasis on continuous training will necessitate more frequent exposure to inclement weather and other adverse environmental circumstances than if a modification of the daily training program had been adopted. This can result in an increase of upper respiratory infections and other diseases aggravated by climatic conditions.

Deployment of troops. Because of the close contact between members of a military unit, it is necessary to hospitalize a man with a relatively minor disease such as German measles to prevent him from transmitting it to the rest of his group. In civil life such a man would stay at home and might not even see a doctor during his illness.

The diseases endemic in different communities also affect hospital planning.

Other Army commitments for hospitalization. Although medical service must be provided for military personnel on active duty, the federal government also is obligated to provide medical care when facilities are available for dependents of military personnel and retired officers and enlisted man. Limitation of facilities normally excludes patients requiring domiciliary care. The authority to determine the availability of facilities is delegated

to each medical facility commander. Others who are authorized medical service when available include foreign military personnel, civilian employees who are determined to be beneficiaries of the Bureau of Employees' Compensation, Department of Labor, and others as specified in AR 40-506.

There may also be bed allotments to the Veterans Administration, Public Health Service, and other agencies.

THE EVACUATION SYSTEM

The morale of fighting men is adversely affected by the sight of their wounded comrades lying unattended on the battlefield. They will stop and give them aid unless there are medical personnel nearby to do so. It is highly important, therefore, to evacuate casualties from the front lines at the earliest practicable time.

Getting patients to specialized treatment hospitals from forward facilities and returning them to the zone of the interior from overseas commands necessitates the operation of an efficient evacuation system. Currently, we transfer patients by air, bus, motor ambulance, rail, and ship. Air evacuation effects about 90 percent of current patient movements. Although there are few conditions for which air travel is contraindicated, some patients refuse this form of travel. Bus, motor, and rail transportation are more economical, especially for short trips. Personal reasons, such as a desire to keep a family together, may dictate transfer by ship from overseas.

Following the establishment in the Civil War of our present plan of evacuation, World War I saw the development of debarkation hospitals at ports in the United States for the reception of patients returned from overseas. They were designed to receive, process, and evacuate large numbers of patients on short notice. They received their patients from hospital ships and evacuated them by hospital trains to general hospitals. They were used on a large scale in World War II.

Air evacuation. The first airplane ambulance was developed in 1918 for the Army. It was designed to deliver a flight surgeon to the scene of airplane crashes and to evacuate casualties. It carried only one patient but proved very valuable. Because the acute need for airplanes of all types in World War II precluded the assignment of planes solely for the purpose of patient evacuation, troop carrier and transport planes were used for this purpose as a secondary mission. A flight team consisting of one nurse and one technician was organized to provide in-flight medical service. The need for air evacuation was demonstrated in 1942 during the construction of the Alcan Route in Alaska, the Burma campaign, and the early counterattacks begun against

the Japanese in the South Pacific Islands. The year 1943 saw the first evacuation over water on a large scale in the North African and Sicilian campaigns. The number of patients transported by air steadily increased until the end of the war in Europe in 1945.

The full potentialities of casualty evacuation by air were realized in the Leyte and Luzon Pacific campaigns in February 1945. Because of inadequate hospital facilities in Luzon, many of the severely injured patients were evacuated directly from the combat areas. Blood and plasma transfusions, oxygen therapy, and shock treatment were given routinely in flight. The light transport aircraft was used to great advantage in the forward combat areas under difficult circumstances.

A Department of Defense directive, dated 7 September 1949, requires evacuation of patients by air in peace or war, but surface means of transportation may be used to augment air evacuation.

In 1950, the helicopter ambulance proved its value in the evacuation of patients from the forward combat areas in Korea. It provides a smooth ride for seriously injured patients and can ascend or descend in a small clearing. It has transferred numerous patients from battalion aid stations to the mobile army surgical hospitals within 30 minutes after injury.

The advantages of air transportation of patients, particularly for long-distance transfers, are: (1) noneffective personnel can be quickly transported out of the combat areas; (2) a patient is transported quickly and easily to a hospital where definitive care can be provided; (3) requirements for overseas hospital beds, medical personnel, rations, medical supplies, hospital ships, and other transportation are reduced; and (4) debarkation bed requirements in the United States are reduced.

The major disadvantages to air transportation of patients are: (1) if an enemy has control of the air, there is a chance that the plane may be shot down, and (2) inclement weather may delay evacuation, although delays from this cause are infrequent.

OTHER FACTORS

Shifting requirements. During the initial and expansion stages of the mobilization of the Army, large numbers of troops are concentrated in the continental United States for training and organization. They are served by large posts and specialized treatment hospitals. During the early phase of mobilization, the bed requirements increase at posts where basic training is given. As the troops are trained, they move to the division posts with a resulting reduction in the need for beds at the training posts and a concurrent increase in the need for beds at the division posts. As the divisions are deployed to overseas areas, part of the hospital facilities at division posts become surplus. Concurrent

with this oversea deployment of personnel, requirements for beds in specialized treatment hospitals increase because of the increased return of casualties from overseas. These additional requirements are met generally by designating the larger station hospitals as specialized treatment centers. Although these hospitals are not ideally located in all instances for specialized care and do not necessarily provide a balanced distribution of Army hospital beds according to the population spread, they do have the advantage of being operating units and being available for immediate use. When these facilities are designated as specialized treatment centers, they assume the double mission of providing post-type hospital support as well as specialized care and treatment.

Reserve requirements. Because of the sharp and rapid fluctuations in the Army hospital system, we need a reserve of hospital beds to meet epidemics, disasters, and the first stages of mobilization. This is an important consideration in the development of hospital plans. We should never again make the mistake of being caught without sufficient reserve beds that can be set up for operation on short notice. These facilities should be available as part of operating hospitals or inactive hospitals held on a stand-by basis. In 1950, the Surgeon General was seriously concerned about where the next available bed was going to be found to care for the casualties from Korea. This type of need is recognized in current hospital planning and a reserve to meet future contingencies has been included in the plans. McCornack Army Hospital, Pasadena, Calif.; Rhoads Army Hospital, Utica, N. Y.; and Birmingham Army Hospital, Santa Barbara, Calif., have been returned to Army control as inactive installations under this program. It is not anticipated that they will be used except in the event of a major mobilization. Action is also in progress to obtain several other Veterans Administration hospitals, which are surplus to their needs, to hold as part of our reserve.

Another important feature of our hospital reserve program is the Table of Organization and Equipment hospitals in active service. Each hospital has its reserve assignment and readiness date. A number of these hospitals have been sent to the Far East since the beginning of the Korean conflict.

We have had a hard time explaining to some Governmental agencies why we need reserve hospital beds although no one questions the need for the Ordnance Department to have reserve guns and ammunition, or for the Quartermaster Department to have reserve stocks of clothing and tents.

Hospital planning for mobilization. Mobilization plans are very important. In the United States, hospital plans are phased

to meet the needs of a mobilizing Army by station. Additional specialized treatment hospitals are to become operative in various localities when required. In World War II, we had over 2 years to build our training camps, division camps, and the supporting station, regional, convalescent, and general hospitals. We are not optimistic enough to believe that we will have time to build new ones in the event of the necessity for another full mobilization. Many of the hospitals disposed of by the Army after World War II had recapture clauses whereby we could reposses them if necessary. They were inspected recently to determine their present condition and the amount of rehabilitation necessary to place them back in operation. One of the hospitals that was carried in our plans to become operative 6 months after mobilization was found to have been completely torn down. Others were found to have been remodeled to such an extent that it would cost less in time and money to build new ones rather than reconvert them back to Army use. Some States were using former Army hospitals for tuberculous and mental patients and they could not surrender them until they had time to build or prepare other facilities for these patients. As a result of this survey, much valuable data, on which to base realistic plans and save time if general mobilization is necessary again, was obtained.

Miscellaneous. Other factors which affect the hospitalization plan are the residency-training program and the qualifications of professional personnel assigned to posts. The residency-training program is the main base on which the standards of professional care and treatment rest and it must be supported. This governs the distribution of specialized treatment centers. The qualifications of hospital staffs on posts affects the evacuation policies and location of hospital beds. If adequate medical service is available at a post, no medical reason exists for transferring a patient to another hospital. Beds for research activities should be assigned in an area where it is convenient to conduct the research.

SUMMARY

The operation of the Army hospital system requires careful and continuous study and planning. An important new discovery may drastically alter current plans at any time. Hospital plans are important factors in the development of plans for facility construction and rehabilitation; procurement and training of Army Medical Service personnel; procurement, storage, and distribution of supplies and equipment; and many other functions of the Army Medical Service. They are important factors in the planning of other staff and technical agencies from the Department of the Army down to the smallest post.

The objectives in hospital planning are the provision of the highest type of medical care in order to facilitate the return to duty of military noneffectives, and the economical use of facilities, equipment, supplies, and personnel. Because elaborate medical facilities cannot be established at every Army installation, an efficient system of evacuation must be established. The categories of patients, installations to be served, and other economic considerations determine the location of hospitals. Bed requirements must be carefully estimated so that beds will be available when and where they are needed, particularly during mobilization. Reserve beds in operating hospitals or inactive hospitals held on a stand-by basis are needed to meet requirements during seasonal fluctuations of disease, epidemics, disasters, and the first stages of mobilization. Other factors which affect hospital planning are the residency-training programs, the qualifications of hospital staffs, and research activities.

In developing a hospital plan for a specific period, an estimate which excludes seasonal fluctuations is first made of the average number of occupied beds. The military strength, mission of commands, deployment of troops, the hospitalization rate experience for the preceding year, and other Army hospital commitments must be considered. The number of patients requiring hospitalization at or in the vicinity of posts is estimated for each installation. The number of patients requiring specialized treatment is estimated by specialty in each Army area or large subdivision thereof. The patient loads are then translated into operating bed requirements allowing for segregation of certain categories of patients and seasonal fluctuations. Facilities are designed on a basis of 100 square feet of floor space per bed.

Co-ordination in hospital planning is effected in the Surgeon General's Office with all interested divisions, all interested staff and technical agencies of the Department of the Army (particularly G4), the Armed Forces Medical Policy Council, and the field. Then implementing directives are co-ordinated and processed through command channels to put the plan into operation.

BOOK REVIEWS

Lillie's Development of the Chick, An Introduction to Embryology, revised by *Howard L. Hamilton,* Associate Professor of Zoology, The Iowa State College, Ames, Iowa. Advisory Editor, *B. H. Willier.* 3d edition. 624 pages; illustrated. Henry Holt & Co., New York, N. Y., publishers, 1952. Price $8.50.

Most chapters of this new edition of a standard text have been expanded and a new one on the integument has been added. The chapter on development, orientation, and chronology has been improved by supplanting the bulky charts of earlier editions with clearly written text supplemented by photographs illustrating development from the prestreak stage through hatching. A new, short description of the development of the lymphatic system will be of interest to laboratory scientists and to veterinarians concerned with the postmortem examination of poultry.

The section on the embryology of the air sacs will be of special interest at this time to those workers investigating "air sac infection" or "chronic respiratory disease" of poultry. The section in chapter 3 on optimal conditions for incubating the egg should be known by all laboratory personnel using embryonated hen's eggs. An excellent index and bibliography are provided.—*Maj. R. O. Anslow, VC, USA*

Endocrine Treatment in General Practice, edited by *Max A. Goldzieher,* M. D. and *Joseph W. Goldzieher,* M. D. 474 pages; illustrated. Springer Publishing Co., Inc., New York, N. Y., 1953. Price $8.

The 21 contributors to this text admirably cover their subject. They have arranged their material according to the localization of presenting symptoms and the types of metabolic disturbance. They point out that since cortisone and ACTH have come into use as pharmacologic agents, other hormones could be used solely for their pharmacologic effects regardless of the presence of an existing deficiency. The use of androgens in order to promote anabolism (protein synthesis and formation of new tissue) is a good example. Controversial opinions are avoided, and the authors have provided a concise, practical, authoritative volume on endocrine therapy. There is no bibliography.

—*Col. R. E. Blount, MC, USA*

A. M. A. SECTION ON MILITARY MEDICINE

THE scientific session of the Section on Military Medicine of the American Medical Association will be conducted on 3 and 4 June 1953 during the 102d annual meeting in New York City. The program will be presented in the North Ballroom of the Astor Hotel, New York, at 1400 hours on Wednesday and Thursday of the week-long meeting. All medical officers of the military departments attending the meeting should register for the Section on Military Medicine. As is customary, eligible Reserve Officers of the Medical Corps will be given retirement point credits. The Military Scientific Exhibits will be displayed at the Exhibit Hall of the Grand Central Palace.

The program for the section follows:

3 June 1953

Chairman's Address—Richard A. Kern, M. D., Philadelphia, Pa.

Helicopters in Peace and War—Brigadier General M. S. White, USAF (MC), and Major Robert W. Merckle, USAF (MC), Langley Air Force Base, Va. Discussion by Brigadier General Alvin L. Gorby, MC, USA, Washington, D.C.

Office of the Assistant to the Secretary of Defense (Health and Medical): Organizational and Functional Evolution—Melvin A. Casberg, M. D., Washington, D. C.

Status of Physicians Draft: Present and Future—Colonel William W. Roe, Jr., MC, USA, Washington, D. C.

Preventive Medicine Problems in Global Air Deployment—Colonel Fratis L. Duff, USAF (MC), Washington, D. C. Discussion by Colonel Theodore C. Bedwell, Jr., USAF (MC), Washington, D. C., and Lieutenant Colonel John Rizzolo, USAF (MC), Gunter Air Force Base, Ala.

Resuscitation of the Severely Injured Battle Casualties—Captain John M. Howard, MC, USAR, and Lieutenant Colonel William H. Crosby, MC, USA, Washington, D. C. Discussion by Francis D. Moore, M. D., Boston, Mass.

Advancements in Submarine Medicine—Commander Gerald J. Duffner, MC, USN, and Commander Jack L. Kinsey, MC, USN, New London, Conn.

4 June 1953

Intra-Arterial Transfusion—Brigadier General Sam F. Seeley, MC, USA, Washington, D. C. Discussion by Captain Robert B. Brown, MC, USN, Bethesda, Md., and Lieutenant Frank Cole Spencer, MC, USNR, Los Angeles, Calif.

Nuclear Energy Propelled Ships: Medical Aspects—Captain Oscar Schneider, MC, USN, and Theodore Rockwell, III, B. S., Ch. E., Washington, D. C. Discussion by John H. Lawrence, M. D., Berkeley, Calif.

Academic Freedom in Military Medical Research—Howard T. Karsner, M. D., and Commander R. A. Phillips, MC, USN, Washington, D. C. Discussion by Lowell T. Coggeshall, M. D., Chicago, Ill., and Stanhope Bayne-Jones, M. D., New York, N. Y.

Medical Aspects of Crash Injuries—Colonel Don S. Wenger, USAF (MC), Washington, D. C. Discussion by Colonel Ralph E. Switzer, USAF (MC), Norton Air Force Base, Calif., and Lieutenant Colonel Robert A. McCall, USAF (MC), Washington, D. C.

Observations of the Fundus Oculi During Blackout—Lieutenant T. D. Duane, MC, USNR, and Lieutenant Commander Edwin L. Beckman, MC, USN, Johnsville, Pa. Discussion by Colonel Victor Burns, USAF (MC), Randolph Air Force Base, Tex., and Captain Oran Chenault, MC, USN, Pensacola, Fla.

BOOK REVIEWS

Oestrogens and Neoplasia, by *Harold Burrows* and *Eric S. Horning,* with Contributions by *W. C. J. Ross* and *C. W. Shoppee.* 189 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1952. Price $6.75.

This book, a composite of the authors' extensive personal research and an exhaustive search of the literature, makes enjoyable reading. The intimate connections between endocrine glands and the close relationship of many neoplasms to endocrine influences are discussed. Numerous questions are posed; many are answered and others await further knowledge. This volume is recommended to all who deal with tumors and should also be read by those who tend to use hormone therapy indiscriminately.

—Capt. L. H. Thomas, MC, USA

Synopsis of Obstetrics, by *Jennings C. Litzenberg,* B. Sc., M. D., F. A. C. S., Late Professor Emeritus of Obstetrics and Gynecology, University of Minnesota Medical School, Minneapolis, Minn. 4th edition, revised by *Chas. E. McLennan,* M. D., Professor of Obstetrics and Gynecology, Stanford University School of Medicine, San Francisco, Calif. 378 pages; 157 illustrations including 5 in color. The C. V. Mosby Co., St. Louis, Mo., publisher, 1952.

This new edition of Litzenberg's text presents in a clear outline enough information to make it a value to medical students and general practitioners. It also serves as a rapid review for those preparing for state board examinations. Material found in the previous edition has been deleted, expanded, and rewritten.

—Lt. Col. S. L. Avner, MC, USA

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